

IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
AUSTIN DIVISION

In re CASSAVA SCIENCES INC.
SECURITIES LITIGATION

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Master File No. 1:21-cv-00751-DAE

CLASS ACTION

This Document Relates to:

ALL ACTIONS

**AFFIDAVIT OF SCOTT CAMPBELL IN SUPPORT OF DEFENDANTS' OPPOSITION
TO PLAINTIFFS' MOTION FOR CLASS CERTIFICATION**

I, Scott Campbell, declare under penalty of perjury:

1. I am an attorney at the law firm of Gibson, Dunn & Crutcher LLP, am admitted *pro hac vice* to the above-referenced action, and am counsel for Defendants in the above-referenced action. I submit this affidavit in support of Defendants' Opposition to Plaintiffs' Motion for Class Certification.

2. Attached are true and correct copies of the following exhibits:

- Exhibit 1: Expert Report of Rene M. Stulz, Ph.D.
- Exhibit 2: Excerpts of June 14, 2024 Deposition of Steven Feinstein, Ph.D., CFA
- Exhibit 3: Excerpts of May 17, 2024 Deposition of Mohammad Bozorgi
- Exhibit 4: Excerpts of May 9, 2024 Deposition of Kenneth Calderone
- Exhibit 5: Excerpts of May 28, 2024 Deposition of Manohar K. Rao
- Exhibit 6: Dan Irvine, "Meme Stock Frenzy Reignites Debate Over Market Integrity," *Forbes* (May 15, 2024)
- Exhibit 7: Cristin Flanagan, "Drugmaker with No Product Gains 911% on Alzheimer's, Meme Hopes," *Bloomberg News* (June 8, 2021)
- Exhibit 8: Cristin Flanagan, "Biotech Finds Market Love at Last as Meme Traders, FDA Converge," *Bloomberg News* (June 11, 2021)
- Exhibit 9: Leke Oso Alabi & Francesca Friday, "Global Stocks Rise for Best Week Since November," *Financial Times* (Feb. 5, 2021)
- Exhibit 10: Emily Graffeo, "Short Sellers Betting Against Meme Stock Cassava Have Made \$100 Million Over the Past Month as the Stock Has Struggled," *Business Insider* (Aug. 31, 2021)
- Exhibit 11: Anviksha Patel, "Short Sellers Hit Back at Cassava Lawsuit Against Them," *MarketWatch* (Nov. 4, 2022)
- Exhibit 12: Isabelle Lee, "Meme Stocks Are Riding a Wave of Reddit Enthusiasm Again, as Traders Cheer Fresh Gains in GameStop, AMC, and BlackBerry," *Business Insider* (Aug. 25, 2021)

- Exhibit 13: Ollie Leech, “WallStreetBets Reddit Group: What Is It?” *CoinDesk* (Jan. 28, 2021)
- Exhibit 14: Cantor Fitzgerald, *AAIC’21 Data May Bode Well for Simu’ Clinical Success with Time, but Priced for Perfection?* (July 14, 2021)
- Exhibit 15: JonesTrading, *Raising PT to \$215/BUY. 9-Month Data De-Risk 12-Month Data in 4Q21; Randomized Trial Data Could Be in 1H/mid22* (July 29, 2021)
- Exhibit 16: H.C. Wainwright & Co., *Better Than Expected 9-Month ADAS-Cog Results; Reiterate Buy and \$124 PT* (July 30, 2021)
- Exhibit 17: U.S. Sec. & Exch. Comm’n, *Staff Report on Equity and Options Market Structure Conditions in Early 2021* (Oct. 14, 2021)
- Exhibit 18: Howard Gold, “Nobel Winner Eugene Fama on GameStop, Market Bubbles and Why Indexing Is King,” *MarketWatch* (Mar. 3, 2021)
- Exhibit 19: JonesTrading, *Clinical Data Remain at the Center of Our Focus; 12-Mo Open Label Data in 4Q21. Reiterating BUY/\$215 PT* (Aug. 25, 2021)
- Exhibit 20: JonesTrading, *Clarification on Biomarker Data from Third Party. Reiterating BUY/\$215 PT* (Aug. 27, 2021)
- Exhibit 21: H.C. Wainwright & Co., *When Doubt Has Come, Stand by Me(chanism of Action) with Simufilam; Reiterate 2021 Top Pick Buy* (Nov. 4, 2021)
- Exhibit 22: Maxim Group, *Connecting the Dots on One Roller Coaster of a Year for SAVA Shares* (Nov. 11, 2021)
- Exhibit 23: Cassava Sciences, Inc., *Cassava Sciences Announces Agreement with FDA on Special Protocol Assessments (SPA) for Its Phase 3 Studies of Simufilam for the Treatment of Alzheimer’s Disease* (Aug. 24, 2021)
- Exhibit 24: Maxim Group, *Suspension of Coverage Report* (Apr. 26, 2022)
- Exhibit 25: U.S. Dep’t of Health & Human Srvs., Food & Drug Admin., *Early Alzheimer’s Disease: Developing Drugs for Treatment* (Feb. 2018)
- Exhibit 26: U.S. Dep’t of Health & Human Srvs., Food & Drug Admin., *Early Alzheimer’s Disease: Developing Drugs for Treatment* (Mar. 2024)
- Exhibit 27: Exhibit 13 of May 17, 2024 Deposition of Mohammad Bozorgi
- Exhibit 28: Excerpts of Exhibit 14 of May 17, 2024 Deposition of Mohammad Bozorgi

Exhibit 29: Excerpts of Cassava Sciences, Inc. Form 10-K Annual Report for the Fiscal Year Ended Dec. 31, 2023

Exhibit 30: Cassava Sciences, Inc., *Cassava Sciences' Simufilam Improves Cognition and Behavior in Alzheimer's Disease in Interim Analysis of Open-Label Study* (Feb. 2, 2021)

I declare under penalty of perjury that the foregoing is true and correct. Executed on June 28, 2024.

/s/ Scott Campbell
SCOTT CAMPBELL

EXHIBIT 1

IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
AUSTIN DIVISION

In re CASSAVA SCIENCES INC.
SECURITIES LITIGATION

Master File No. 1:21-cv-00751-DAE

EXPERT REPORT OF RENE M. STULZ, Ph.D.

June 28, 2024

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I. Qualifications

1. I hold the Everett D. Reese Chair of Banking and Monetary Economics at The Ohio State University. I am also Director of the Dice Center for Research in Financial Economics at The Ohio State University and a Research Associate of the National Bureau of Economic Research in Cambridge, Massachusetts. Since receiving my Ph.D. in Economics from the Massachusetts Institute of Technology in 1980, I have taught at the Massachusetts Institute of Technology, the University of Rochester, the University of Chicago, and The Ohio State University. I was a Bower Fellow at the Harvard Business School from 1996 to 1997.

2. I am a past president of the American Finance Association; a fellow of the American Finance Association, the Financial Management Association, the European Corporate Governance Institute, and the Wharton Financial Institutions Center; and a past president of the Western Finance Association. I received a Doctorate Honoris Causa from the University of Neuchâtel in Switzerland, an Honorary Doctorate of Laws from University College Dublin, and the Risk Manager of the Year award from the Global Association of Risk Professionals. I have also been recognized by a number of organizations for my contributions to financial economics by awards or by invitations to be a keynote speaker.

3. I belong to the editorial boards of many academic and practitioner publications. Further, I am a member of the Asset Pricing and Corporate Finance Programs and was the director of the Risk of Financial Institutions Group of the National Bureau of Economic Research for more than fifteen years. I was editor of the *Journal of Finance* for 12 years and co-editor of the *Journal of Financial Economics* for five years (these are two of the top three journals in the field of financial economics). Thomson Reuters has included me in its list of the world's most influential scientific minds, which identifies top researchers based on the number of authored publications that are highly cited by peers.¹

4. I have published more than 100 articles in finance and economics journals, including the *Journal of Political Economy*, the *Journal of Financial Economics*, the *Journal of Finance*, and the *Review of Financial Studies*. I am the author of a textbook titled *Risk Management and Derivatives*, a co-author of *The Squam Lake Report: Fixing the Financial System*, and have edited several books, including the *Handbook of the Economics of Finance* and *International Capital Markets*.

¹ See, e.g., "The World's Most Influential Scientific Minds," *Thomson Reuters*, December 2015, p. 46.

5. I have taught in executive development programs in North America, Europe, and Asia, and consulted for major corporations, law firms, the New York Stock Exchange, the International Monetary Fund, and the World Bank. I have also served as a member of advisory boards of the U.S. Treasury and of the Federal Reserve Bank of New York. I have belonged to several corporate boards and was the vice-chairman of the board of trustees of the Global Association of Risk Professionals, where I also chaired the governance committee.

6. A copy of my curriculum vitae is attached as **Appendix A**, which also includes a list of my publications over the last 10 years. **Appendix B** contains a list of my testimony over the last four years.

II. Assignment and Compensation

7. I have been retained by counsel for Cassava Sciences, Inc. (“Cassava” or the “Company”). I was asked to review and respond to the report of Dr. Steven P. Feinstein, Ph.D. dated March 13, 2024 (“Feinstein Report”).² Specifically, I was asked to address Dr. Feinstein’s analysis and opinions with respect to market efficiency for Cassava’s common stock and options. I was also asked to assess whether Dr. Feinstein has put forth a methodology capable of reliably measuring class-wide damages for Cassava’s common stock or options in a manner consistent with Plaintiffs’ theory of liability.

8. The analyses and opinions expressed in this report are my own. I am compensated for my time and services on this case at my regular hourly rate of \$1,450. I am assisted in this matter by staff of Cornerstone Research, who work under my direction. I receive compensation from Cornerstone Research based on its collected staff billings for its support of me in this matter. Neither my compensation in this matter nor my compensation from Cornerstone Research is in any way contingent or based on the content of my opinions or the outcome of this or any other matter.

9. A list of the materials that I considered in preparing this report is attached as **Appendix C**. My work in this matter is ongoing, and I reserve the right to supplement my opinions in the event that Plaintiffs or their experts submit additional analyses or information.

² Report on Market Efficiency and Damages Methodology by Professor Steven P. Feinstein, Ph.D., dated March 13, 2024 (“Feinstein Report”).

III. Summary of Allegations

10. In this section, I provide a summary of my understanding of Plaintiffs' allegations as stated in the Supplemented Consolidated Complaint,³ and as summarized in Plaintiffs' opposition to the motion to dismiss the Consolidated Complaint on December 27, 2022 ("Plaintiffs' Opposition to MTD")⁴ and in the Feinstein Report.

11. Plaintiffs allege violations of Section 10(b) and 20(a) of the Securities Exchange Act of 1934 on behalf of investors who purchased or acquired Cassava's stock or call options, or who sold put options, between September 14, 2020 and October 12, 2023 ("Proposed Class Period").⁵

12. Plaintiffs allege that the prices of Cassava securities were artificially inflated by alleged misrepresentations by Defendants related to its Alzheimer's drug, simufilam.⁶ Under Plaintiffs' theory, the Proposed Class Period begins on September 14, 2020, when Cassava issued a press release and participated in a conference call announcing promising biomarker and cognition study results from the Phase 2b study for simufilam.⁷ Plaintiffs claim numerous alleged misrepresentations on subsequent dates, through April 2022.⁸

13. Plaintiffs describe four categories of alleged misrepresentations by Defendants:

- a. "Misstatements Concerning Cassava's Research": Plaintiffs allege that Cassava's statements about "pre-clinical research and their Phase 2a and 2b clinical trial results concealed that they contained rampant and intentional splicing, duplication and other forms of data manipulation and falsification."⁹ Further, "Defendants concealed that both simufilam's [sic] Phase 2a trial and 2b reanalysis suffered from highly anomalous baseline measurements

³ Supplemented Consolidated Complaint, *In re Cassava Sciences, Inc. Securities Litigation*, District Court for the Western District of Texas, Austin Division, Master File No. 1:21-cv-00751-DAE, June 12, 2024 ("Supplemented Consolidated Complaint").

⁴ Plaintiffs' Opposition to Motion to Dismiss Consolidated Complaint for Violations of the Federal Securities Laws, *In re Cassava Sciences, Inc. Securities Litigation*, District Court for the Western District of Texas, Austin Division, Master File No. 1:21-cv-00751-DAE, December 27, 2022 ("Plaintiffs' Opposition to MTD").

⁵ Supplemented Consolidated Complaint, ¶ 46; Feinstein Report, ¶ 1; Plaintiffs' Opposed Motion for Class Certification, *In re Cassava Sciences, Inc. Securities Litigation*, District Court for the Western District of Texas, Austin Division, Master File No. 1:21-cv-00751-DAE, March 13, 2024, p. 5 ("The proposed Class includes all purchasers or acquirers of Cassava common stock or call options on Cassava common or sellers of put options on Cassava common stock ('Cassava Securities') between September 14, 2020 and October 12, 2023, inclusive.").

⁶ Supplemented Consolidated Complaint, ¶¶ 1, 46–47. As the Feinstein Report notes "[p]ut options will be artificially depressed in price when the underlying stock price is artificially inflated, as put option prices are a negative function of the underlying stock price." See Feinstein Report, ¶ 188.

⁷ Supplemented Consolidated Complaint, ¶¶ 268–279.

⁸ Supplemented Consolidated Complaint, Sections VI–IX.

⁹ Plaintiffs' Opposition to MTD, p. 14.

undermining the reliability and validity of the results, and misstated the results of the Spatial Memory test.”¹⁰

- b. “Misstatements Concerning Conflicts of Interest”: Plaintiffs allege that “Defendants’ statements that Cassava’s Phase 2b reanalysis was conducted by an ‘outside’ lab were false and misleading” because “Defendants failed to disclose that the reanalysis was conducted by [Cassava’s primary scientific consultant, Dr. Hoau-Yan Wang], a paid Company consultant and a member of Cassava’s ‘in-house’ product development team.”¹¹
- c. “Misstatements in Cassava’s Response to the Citizen Petition”: Plaintiffs allege that, in response to a citizen petition submitted to the Food and Drug Administration (“FDA”) in August 2021 (“Citizen Petition”), Cassava “attempt[ed] to misleadingly suggest that the data presented was validated by an independent lab [Quanterix]” and made an incorrect statement about the “plasma P-tau181 data point missing from the AAIC poster.”¹²
- d. “Misstatements Concerning Government Investigations”: Plaintiffs allege that when Cassava announced that certain government agencies had requested information from the Company, it “concealed that: (i) it was the subject of civil and criminal investigations by the [Securities and Exchange Commission (“SEC”), Department of Justice (“DOJ”) and National Institutes of Health (“NIH”)] into the allegations of manipulated research results; and (ii) that ... the Company could no longer obtain important funding from the NIH.”¹³

14. I understand based on my review of the Supplemented Consolidated Complaint that Plaintiffs allege that corrective information about the alleged misrepresentations was disclosed on 17 dates during the Proposed Class Period.¹⁴ Dr. Feinstein discusses nine of these alleged corrective disclosures in his report.¹⁵ According to Plaintiffs and, as indicated below, by Dr. Feinstein, the alleged “truth” impacted the prices of the Cassava Securities on the following dates:

¹⁰ Plaintiffs’ Opposition to MTD, p. 19.

¹¹ Plaintiffs’ Opposition to MTD, p. 20; Supplemented Consolidated Complaint, ¶ 1.

¹² Plaintiffs’ Opposition to MTD, p. 21.

¹³ Plaintiffs’ Opposition to MTD, pp. 21–22.

¹⁴ These are dates from Section I as well as Sections VII–IX of the Supplemented Consolidated Complaint on which Plaintiffs discuss allegedly corrective information that was disclosed. Plaintiffs discuss six of these dates in the section of the Supplement Consolidated Complaint (Section XII) discussing loss causation and economic loss.

¹⁵ Feinstein Report, Section V.

- a. August 25, 2021 (discussed by Dr. Feinstein): Reports of a Citizen Petition about Cassava became public after market closing on August 24, 2021.¹⁶ The Citizen Petition “raised concerns regarding the ‘quality and integrity of the laboratory-based studies’ involving simufilam.”¹⁷ Plaintiffs allege that Cassava’s stock price declined on August 25, 2021 in response to this news, and continued to react on the subsequent trading day, August 26, 2021.¹⁸
- b. August 27, 2021 (discussed by Dr. Feinstein): “Quanterix released a ... statement detailing its responsibilities vis-à-vis the Phase 2b simufilam study.”¹⁹ Further, having reviewed images included in the Citizen Petition, “world renown[ed] image analyst Dr. Elisabeth Bik” agreed “‘with most of those concerns [raised in the Citizen Petition]’” and “‘also found some additional problems.’”²⁰
- c. August 30, 2021 (discussed by Dr. Feinstein): “[A] supplement to the Citizen Petition identified additional examples of apparent scientific misconduct by Cassava and Dr. Wang.”²¹ The supplement “reported that the poster Cassava presented at the [Alzheimer’s Association International Conference (“AAIC”)] on July 26, 2021 contained data discrepancies.”²²
- d. September 3, 2021 (discussed by Dr. Feinstein): “[T]he Company admitted that some contents of the Citizen Petition and its supplement were true.”²³
- e. November 10, 2021: After Cassava disclosed that the *Journal of Neuroscience* had found “no evidence of data manipulation” in an article by Dr. Wang, Dr. Bik “and others” raised concerns about the “original data” that had been made public by the *Journal of Neuroscience*.²⁴
- f. November 15, 2021 (discussed by Dr. Feinstein): The Company disclosed in its Form 10-Q “that certain ‘government agencies have asked us to provide them with corporate information and documents.’”²⁵

¹⁶ Plaintiffs’ Opposition to MTD, p. 7.

¹⁷ Feinstein Report, ¶¶ 47–48. See also Supplemented Consolidated Complaint, ¶¶ 13–15, 316–318.

¹⁸ Supplemented Consolidated Complaint, ¶ 15.

¹⁹ Feinstein Report, ¶ 49. See also Supplemented Consolidated Complaint, ¶¶ 16–17, 323–327.

²⁰ Supplemented Consolidated Complaint, ¶¶ 18, 326.

²¹ Feinstein Report, ¶ 50.

²² Supplemented Consolidated Complaint, ¶¶ 18–19, 328–330.

²³ Feinstein Report, ¶ 50. See also Supplemented Consolidated Complaint, ¶¶ 20–21, 331–337.

²⁴ Supplemented Consolidated Complaint, ¶¶ 22, 24–25, 344–349.

²⁵ Feinstein Report, ¶ 51. See also Supplemented Consolidated Complaint, ¶¶ 26–27, 363–364.

- g. November 17, 2021 (discussed by Dr. Feinstein): “*The Wall Street Journal* reported that the SEC and National Institute of Health were investigating research manipulation claims, and that [CUNY] had opened an investigation into Dr. Wang.”²⁶ Additionally, the third Citizen Petition supplement alleged anomalous baseline results for Cassava’s Phase 2a and Phase 2b studies and claimed some experiments were “seemingly undoable.”²⁷
- h. December 9, 2021: the fourth Citizen Petition supplement claimed “irrefutable evidence of data manipulation/fabrication” in a 2017 *Neurobiology of Aging* paper by Dr. Wang.²⁸
- i. December 17, 2021: the *Journal of Neuroscience* issued an “expression of concern” about alleged data manipulation in a study by Dr. Wang and Dr. Lindsay Burns (Cassava’s Senior Vice President of Neuroscience).²⁹ Based on the stock price change discussed in the Supplemented Consolidated Complaint, Plaintiffs appear to suggest that the market continued to react on the subsequent trading day, December 20, 2021.³⁰
- j. December 21, 2021: In response to a statement by the journal *Neuroscience* that it found “no evidence of manipulation,” Dr. Bik questioned whether original data had been provided to the journal.³¹
- k. January 3, 2022: The journal *Molecular Neurodegeneration* retracted a paper by Dr. Wang “due to irregularities found in published data.”³²
- l. March 22, 2022: The journal *Neurobiology of Aging* issued an expression of concern regarding a 2017 study by Dr. Wang and Dr. Burns.³³
- m. March 30, 2022: The journal *PLOS One* retracted five papers by Dr. Wang and his co-authors.³⁴

²⁶ Feinstein Report, ¶ 52. See also Supplemented Consolidated Complaint, ¶¶ 28, 30, 367–371.

²⁷ Supplemented Consolidated Complaint, ¶¶ 29–30, 372–379.

²⁸ Supplemented Consolidated Complaint, ¶¶ 31–32, 380–385.

²⁹ Supplemented Consolidated Complaint, ¶¶ 1, 33–34, 357–360.

³⁰ Supplemented Consolidated Complaint, ¶¶ 33–34 (“On December 17, 2021, the *Journal of Neuroscience* changed its ‘Editorial Note,’ ...[o]n this news, Cassava’s stock price fell 15.6%, or \$6.82 per share, between Friday, December 17 and Monday, December 20, 2021, to close at \$36.77 per share.”). The price drop calculated in the Supplemented Consolidated Complaint is the difference between Cassava’s closing stock price on December 16, 2021 and December 20, 2021, which were \$43.59 and \$36.77 respectively according to *Refinitiv Eikon*.

³¹ Supplemented Consolidated Complaint, ¶¶ 36, 386–390.

³² Supplemented Consolidated Complaint, ¶¶ 37, 408–410.

³³ Supplemented Consolidated Complaint, ¶¶ 38, 414–418.

³⁴ Supplemented Consolidated Complaint, ¶¶ 39, 423–424.

- n. April 19, 2022 (discussed by Dr. Feinstein): A *New York Times* article published after market closing on April 18, 2022 reported “that there was a growing scientific community consensus that the Company’s research was suspect.”³⁵ Plaintiffs allege that Cassava’s stock price declined on April 19, 2022 in response to this news, and continued to react on the subsequent trading day, April 20, 2022.³⁶
- o. June 1, 2022: The journal *Alzheimer’s Research & Therapy* retracted a 2017 paper by Dr. Wang.³⁷
- p. July 27, 2022 (discussed by Dr. Feinstein): Reuters reported that the DOJ “was opening a criminal investigation into the Company.”³⁸
- q. October 13, 2023 (discussed by Dr. Feinstein): After market closing on October 12, 2023, “*Science Magazine* reported that the CUNY’s investigation into Dr. Wang resulted in accusations of ‘scientific misconduct involving 20 research papers.’”³⁹ Plaintiffs allege that Cassava’s stock price declined on October 13, 2023 in response to this news, and continued to react on the subsequent trading day, October 16, 2023.⁴⁰

IV. Summary of Opinions

15. Below is a summary of my opinions. The bases for my opinions are detailed in the sections that follow.

16. **Stock Market Efficiency:** As discussed in **Section VI**, Dr. Feinstein’s analysis with respect to market efficiency for Cassava’s common stock consists of a “collective event study” for the purpose of testing the “cause-and-effect” relationship under *Cammer* Factor 5, in addition to analyses of seven other *Cammer* and *Krogman* factors. His analyses of these factors are deficient, flawed, and unreliable for several reasons. In particular, he fails to

³⁵ Feinstein Report, ¶ 53; “Scientists Question Data Behind an Experimental Alzheimer’s Drug,” *The New York Times*, April 18, 2022. See also Supplemented Consolidated Complaint, ¶¶ 40–41, 425–432.

³⁶ Supplemented Consolidated Complaint, ¶ 41.

³⁷ Supplemented Consolidated Complaint, ¶¶ 42–43, 433–434.

³⁸ Feinstein Report, ¶ 54. See also Supplemented Consolidated Complaint, ¶¶ 44–45, 435–437.

³⁹ Feinstein Report, ¶ 55; “Co-developer of Cassava’s Potential Alzheimer’s Drug Cited for ‘Egregious Misconduct’,” *Science Magazine*, October 12, 2023. See also Supplemented Consolidated Complaint, Supp. ¶¶ 1–2.

⁴⁰ Supplemented Consolidated Complaint, Supp. ¶ 5.

address evidence potentially inconsistent with a conclusion of market efficiency, even using his own criteria.

17. When constructing his “collective event study” and market efficiency analysis in general, Dr. Feinstein fails to address how Cassava’s stock’s trading and his conclusion regarding market efficiency could be impacted by the “meme stock phenomenon.” The term “meme stock phenomenon” is used by academics, regulators, and market participants to refer to situations occurring since early 2021 where certain stocks become popular among retail investors on social media and online forums, and experience extremely large stock price movements, at times resulting from trading frenzies,⁴¹ in the absence of new, value-relevant public information about the stocks (*i.e.*, information that would inform investors about the present value of the company’s expected future cash flows) that could justify such movements. Accordingly, various academics and market participants have found evidence of, or raised questions regarding, market *inefficiency* for certain retail-investor-focused stocks in recent years.

18. Dr. Feinstein testified in his deposition that, subsequent to filing his report, he asked an assistant to review social media activity for Cassava. He also testified that he reviewed the mix of information on all the days with statistically significant price movements, including those he classifies as “non- or lesser-news days” or “ordinary days”. Even though I have not seen backup analysis to support these assertions, according to Dr. Feinstein’s testimony, he apparently found nothing noteworthy or anything that warranted revisions to his report. The Feinstein Report ignores the fact that market commentators attributed certain large movements in Cassava’s price during the Proposed Class Period to “meme traders” or even characterized Cassava as a “meme stock.” Moreover, Cassava experienced a large increase in social media attention during the Proposed Class Period, which, during certain portions of the Proposed Class Period, is comparable to meme stocks analyzed in the academic literature; experienced large price movements that significantly exceeded broader market movements; and was classified as a “meme stock” in a financial index of meme stocks.

19. Contrary to Dr. Feinstein’s failure to analyze the meme stock phenomenon’s potential impact on Cassava’s stock and dismissal of the possibility that meme-related issues might

⁴¹ “Trading frenzies in financial markets occur when many speculators rush to trade in the same direction leading to large pressure on prices.” See I. Goldstein, E. Ozdenoren, and K. Yuan (2013), “Trading Frenzies and Their Impact on Real Investment,” *Journal of Financial Economics* 109(2), pp. 566–582 (“Goldstein et al. (2013)”) at p. 566.

present any evidence inconsistent with the notion of market efficiency for Cassava, using Dr. Feinstein's "collective event study" framework, I find that there is a concentration of statistically significant price movements on dates with high social-media activity. This is despite such dates being classified as "non- or lesser-news days" or "ordinary days" by Dr. Feinstein. Based on the same statistical test that Dr. Feinstein relies on, the "incidence of statistical significance" for this group of days is in fact statistically indistinguishable from that of Dr. Feinstein's "news days". On the majority of these high social media activity days, my analysis has not identified any new, value-relevant, public information that could explain the price movement in a manner consistent with market efficiency. This finding suggests that either Cassava's stock price was often moving in the absence of new, value-relevant information, inconsistent with the "cause-and-effect" relationship Dr. Feinstein attempts to establish, or that the construction of Dr. Feinstein's "collective event study" is deficient and flawed, or both. Either interpretation renders Dr. Feinstein's conclusion regarding market efficiency unreliable.

20. Additionally, Dr. Feinstein's analysis of the other *Cammer* and *Krogman* factors suffers from flaws and deficiencies as well. For example, Dr. Feinstein glosses over the substantial changes in Cassava's stock over the 37-month Proposed Class Period. Dr. Feinstein fails to analyze the constraints on the number of Cassava shares available for borrowing by a short seller or the costs of short selling Cassava's stock, which were especially high during 2022. Likewise, Dr. Feinstein fails to address the implications of low analyst coverage for periods of the Proposed Class Period, particularly in light of the reasons analysts articulated for dropping coverage.

21. **Options Markets Efficiency:** I explain in **Section VII** how Dr. Feinstein's analysis of the efficiency of the markets for Cassava options is flawed and unreliable for several reasons. For example, Dr. Feinstein attempts to establish the efficiency of the Cassava options markets based on the purported efficiency of the Cassava stock market (and other markets). However, this conclusion is unreliable because (1) it is based on his unreliable assessment of efficiency for Cassava's stock as discussed above, and (2) the individual Cassava options traded in different markets and had different characteristics.

22. **Additionally,** Dr. Feinstein fails to demonstrate a "cause-and-effect" relationship between new, value-relevant information and individual option prices. His analysis of Cassava options is based on his creation of one aggregate "synthetic stock price," which is an average, imputed price based on the application of a theoretical relationship to each of over

7,000 pairs of individual Cassava options. To derive his synthetic stock price, Dr. Feinstein relies not on actual trade prices, but on quotes, which represent the bids or the offers posted by market participants at prices they are willing to trade. However, relying on quotes obscures the fact that many options traded infrequently, and that many options did not trade on days with large price movements or news identified by Dr. Feinstein. Additionally, I show that—as for the stock—Dr. Feinstein ignores a large proportion of statistically significant movements in his synthetic stock price that appear on days that he characterizes as “non- or lesser-news days”.

23. Further, Dr. Feinstein fails to consider the *Cammer* and *Krogman* factors that he analyzes for Cassava’s stock, some of which show that the markets for many options were illiquid, with sparse trading and high transaction costs. I also show that Dr. Feinstein’s analysis of Cassava options ignores striking differences among the individual options, including differences in the measures that Dr. Feinstein uses to assess efficiency. Indeed, by comparing only the *average* synthetic stock price with Cassava’s common stock price, I show that Dr. Feinstein obscures the fact that some of his synthetic stock prices deviate from the common stock price substantially. This deficiency further renders his conclusion of market efficiency across all Cassava options unreliable.

24. **Lack of Statistically Significant Stock Returns on Many Alleged Corrective**

Disclosure Dates: As discussed in **Section VIII**, on the majority of days on which I understand Plaintiffs allege corrective information came to the market or the market continued to react to allegedly corrective information, Cassava’s stock price did not experience a statistically significant residual return in any of Dr. Feinstein’s event study models. On such dates, there is no scientific basis to conclude that the price movements were not caused by random variation in the stock price. For purposes of his damages methodology, Dr. Feinstein fails to explain how, when estimating inflation attributed to the alleged misrepresentations, he can account for the absence of statistically significant price declines associated with the majority of the alleged corrective disclosures Plaintiffs allege.

25. **Damages Methodology:** With respect to his proposed damages approach for Cassava’s stock, Dr. Feinstein fails to explain how the generic approaches he describes can reliably address the specific features of the matter at hand in a manner that is consistent with Plaintiffs’ theory of liability, as discussed in **Section IX**.

26. To begin, Dr. Feinstein has not explained how he could separately estimate damages associated with different categories of allegations, if required, particularly given that the

alleged corrective information often pertains simultaneously to different categories of alleged misrepresentations. Dr. Feinstein instead appeared to claim at his deposition that under a so-called “scheme theory of liability,” one does not need to match alleged corrective disclosures with alleged misrepresentations when assessing inflation using the stock price declines. Not only did Dr. Feinstein provide no support for such a claim, he also failed to specify what “valuation tools” could be reliably used to estimate the impact of disclosures related to different categories of misrepresentations, if required.

27. Dr. Feinstein fails to explain how he could measure Cassava’s stock price movement attributable to revelation of the facts allegedly misrepresented, rather than the negative impact from other factors, such as critical third-party commentary and uncertainty associated with certain investigations and regulatory processes, which would potentially have weighed negatively on the Company’s ongoing operations and therefore stock price. Further, Dr. Feinstein has not explained how he could reliably ascertain whether the large stock price declines following the alleged corrective disclosures were due to allegedly corrective information, or say, due to abatement of the impact from the meme stock phenomenon, which Dr. Feinstein failed to reliably address.

28. Moreover, Dr. Feinstein appears to suggest that one can “back-cast” the dollar residual price declines on alleged corrective disclosure dates as a measure of inflation. However, given the size of the residual price declines on some alleged corrective disclosure dates, such an approach implausibly implies that Cassava’s stock price but for the alleged misrepresentations would have been *negative* for much of the first year of the Proposed Class Period. Given the particular pattern of Cassava’s stock price movements during the Proposed Class Period, as well as the “meme stock phenomenon,” Dr. Feinstein has not established that the residual price declines on the alleged corrective disclosure dates can reliably be used to estimate the amount of inflation removed on that day or to provide a reliable measure of inflation earlier in the Proposed Class Period.⁴² For purposes of estimating inflation, Dr. Feinstein also does not explain how he will account for changes over the course of the Proposed Class Period in (1) what Cassava could have disclosed earlier, or (2) the value impact of such “but-for” disclosures.

⁴² As explained in Sections VIII and IX, Dr. Feinstein fails to explain how back-casting the residual stock price declines, whether in dollar or percentage terms, could reliably be performed in a manner consistent with Plaintiffs’ theory of liability.

29. Finally, Dr. Feinstein proposes to measure damages for Cassava options based on stock price inflation, as well as a theoretical option pricing relationship between stock and options. However, his damages approach for the options depends critically on his ability to reliably estimate stock price inflation consistent with Plaintiffs' theory of liability, which he fails to establish. In addition, the implicit assumption in Dr. Feinstein's proposed option damages methodology that new public information about the Company was rapidly incorporated in *each* option is not supported by his market efficiency analysis that investigates only a *portfolio* of options. Moreover, Dr. Feinstein has conducted no analysis to establish whether the theoretical option pricing relationships he would be relying on were reflected in the actual option price data, and my analysis suggests that they did not consistently hold. Although expected volatility is an important factor in determining option prices, Dr. Feinstein fails to explain how he would estimate the expected volatility that would have prevailed for each option but-for the alleged misrepresentations, in order to reliably estimate "but-for" option prices. Finally, Dr. Feinstein fails to explain how he would determine that Cassava's put option prices were "artificially depressed" and ignores that some members of the proposed class may have traded in multiple securities, potentially *benefitting* from the alleged fraud for certain trades or securities, while being harmed for others.

V. Market Efficiency in Financial Economics

30. The concept of market efficiency in financial economics was introduced in the 1960s by Eugene Fama and Paul Samuelson. Professor Fama defined an efficient market as a "market in which prices provide accurate signals for resource allocation: that is, a market in which firms can make production-investment decisions, and investors can choose among the securities that represent ownership of firms' activities under the assumption that security prices at any time 'fully reflect' *all* available information."⁴³ The question of whether markets are efficient has been investigated in various financial markets over the past fifty years.

⁴³ E. F. Fama (1970), "Efficient Capital Markets: A Review of Theory and Empirical Work," *The Journal of Finance* 25(2), pp. 383–417 ("Fama (1970)") at p. 383 (emphasis added).

31. Financial economists recognize three forms of market efficiency: weak form, semi-strong form, and strong form.⁴⁴ In a weak form efficient market, historical returns or prices cannot be used to predict future price movements.⁴⁵ In a semi-strong form efficient market, security prices react quickly and fully to new, unexpected, value-relevant public information, so that security prices reflect all public information fully and quickly. As a result, neither historical returns or prices, nor public information, can be used to predict future price movements in a semi-strong form efficient market.⁴⁶ In a strong form efficient market, prices react quickly and fully not only to public information (as in semi-strong form efficient markets), but also to private information.⁴⁷ When referring to market efficiency and efficient markets in this report, I refer to the semi-strong form of market efficiency, which I understand is relevant in this setting. Dr. Feinstein's definition of efficiency seems to most closely correspond to the semi-strong form of market efficiency.⁴⁸

32. In an efficient market, trading by investors will quickly eliminate situations where public information is not incorporated in stock prices because investors will be strongly incentivized to take advantage of such situations. For example, if, at any given time, some positive, value-relevant, public information about the future prospects of a company is not, for whatever reason, yet incorporated in the price of the company's securities, in an efficient market traders with access to that information will rapidly choose to buy the security, driving the price up. Similarly, traders with access to negative, value-relevant, public information about the future prospects of a company that is not yet incorporated in the security price will rapidly choose to sell or short sell the security, driving the price down.⁴⁹

33. Importantly, for value-relevant information to be incorporated in a security's price, it does not have to be widely known or disseminated. All that is required is that some arbitrageurs have access to that information and are willing to trade on it up to the point

⁴⁴ Fama (1970), p. 388.

⁴⁵ Fama (1970), p. 388.

⁴⁶ Fama (1970), p. 388.

⁴⁷ Fama (1970), p. 388.

⁴⁸ Feinstein Report, ¶ 58 ("Simply put, market efficiency means that material public information is not ignored by the market, but rather is considered by market participants, and is incorporated and reflected in the trading prices of securities with reasonable promptness."). In his deposition, Dr. Feinstein described efficiency with respect to public information as "semi-strong efficiency." See Deposition of Steven Feinstein, June 14, 2024 ("Feinstein Deposition"), 146:6–146:13 ("If the information we're talking about is public information ... [y]ou have what's called 'semistrong efficiency'.").

⁴⁹ In his deposition, Dr. Feinstein agreed that the most important factor for the future prospects of Cassava was the likelihood of commercialization of the company's drug candidate, simufilam. See Feinstein Deposition, 137:8–137:12.

where that information is incorporated into the stock price.⁵⁰ If the stock price does not react quickly to a piece of publicly available information (*i.e.*, few investors try to obtain or act on the information despite the fact that the information is not costly to access), it could be that the information is stale, the information is not value-relevant, or the market is not efficient.

34. On the other hand, in a prominent finance textbook examining potential deviations from efficiency in financial markets, Professor Shleifer explains that one should observe “non-reaction to non-information” in an efficient market, as “prices should not move without any news about the value of the security.”⁵¹

35. Information that is stale, reiterated, or otherwise not value-relevant should not impact security prices if markets are semi-strong form efficient. In other words, it would be inconsistent with market efficiency if one finds that reiteration of previously publicly-disclosed information, or information that has no bearing on the company’s expected future cash flows, impacts a company’s stock price. As an introductory corporate finance textbook states:

According to the efficient-market hypothesis, a stock’s abnormal return at time t , AR_t , should reflect the release of information at the same time, t . Any information released before then, though, should have no effect on abnormal returns in this period, because all of its influence should have been felt before. In other words, an efficient market would already have incorporated previous information into prices.⁵²

36. Research has shown, however, that even securities listed on major stock exchanges may not trade in an efficient market at all times. Since the time when Professor Fama published his seminal work on market efficiency,⁵³ empirical academic research has studied implications for the efficient market hypothesis for real-world complexities in markets, and in

⁵⁰ Competition among investors incentivizes arbitrageurs to search for and trade on value-relevant information. As examples, news articles from the *Wall Street Journal* or *Bloomberg*, academic articles, and securities analyst reports can require subscriptions or other out-of-pocket costs to access them. To the extent such sources include information about the future prospects of a company not yet, for whatever reason, incorporated in the company’s stock price, arbitrageurs have an incentive to access that information and rapidly buy (or sell) the stock (depending on the information), driving the price up (or down).

⁵¹ A. Shleifer (2000), *Inefficient Markets: An Introduction to Behavioral Finance*, Oxford, UK: Oxford University Press (“Shleifer (2000)”), p. 5.

⁵² S. A. Ross, R. W. Westerfield, and J. F. Jaffe (2010), *Corporate Finance*, 9th ed., New York NY: McGraw-Hill (“Ross et al. (2010)”), p. 440 (emphasis in original). See also Shleifer (2000), p. 5 (“The principal hypothesis following from quick and accurate reaction of prices to new information is that stale information is of no value in making money, as Fama (1970) points out.”).

⁵³ I was editor of the *Journal of Finance* when it accepted for publication Prof. Fama’s widely cited paper on market efficiency, “Efficient Capital Markets: II.” See E. F. Fama (1991), “Efficient Capital Markets: II,” *The Journal of Finance* 46(5), pp. 1575–1617.

particular, the role of market frictions. A seminal study published in 1997 by Professors Shleifer and Vishny showed that there can be limits to the ability of investors to exploit departures from efficiency, and that these limits (often referred to as “limits to arbitrage”)⁵⁴ arise because of the existence of market frictions.⁵⁵

37. Since the article by Professors Shleifer and Vishny, the academic literature has continued to study frictions in the way markets work that may impede market efficiency. Examples of such frictions include funding constraints,⁵⁶ constraints on trading,⁵⁷ constraints on investor attention,⁵⁸ and frictions due to processing of information.⁵⁹ These frictions can lead to situations where stock prices fail to react to new, value-relevant public information.⁶⁰

38. One example of an arbitrage mechanism that can be impeded by these types of frictions is short selling. Short selling plays an important role in market efficiency by increasing share supply, providing liquidity, and allowing for rapid incorporation of public information into prices.⁶¹ To sell a stock short, an investor must first borrow the stock from a lender in an equity lending market, then sell the borrowed share on the market.⁶² The investor benefits from a short sale when she closes the short position by buying the stock back in the market at a lower price than she sold it and delivering the stock to the stock lender. However, high costs, risks, and uncertainties associated with short selling can limit the ability of

⁵⁴ In financial economics, the traditional meaning of an arbitrage transaction is a transaction that exploits the mispricing of a security to earn a riskless profit. An example would be a security that trades at different prices on different markets, so it could be bought at a lower price on one market and sold simultaneously at a higher price on another market. However, as explained by Professors Shleifer and Vishny, almost all arbitrage transactions involve a certain degree of risk. Therefore, a more general meaning of an arbitrage transaction is a transaction that exploits the mispricing of a security at low risk, for instance by constructing a position that is largely hedged. Market participants who take advantage of the mispricing of securities through arbitrage transactions are called arbitrageurs. See A. Shleifer and R. W. Vishny (1997), “The Limits of Arbitrage,” *The Journal of Finance* 52(1), pp. 35–55 (“Shleifer and Vishny (1997)”).

⁵⁵ The article prominently focused on the difficulties that arbitrageurs, such as hedge funds, may face in raising funds to exploit market inefficiencies. See Shleifer and Vishny (1997).

⁵⁶ See, e.g., M. Mitchell and T. Pulvino (2012), “Arbitrage Crashes and the Speed of Capital,” *Journal of Financial Economics* 104(3), pp. 469–490.

⁵⁷ See, e.g., G. D’Avolio (2002), “The Market for Borrowing Stock,” *Journal of Financial Economics* 66(2), pp. 271–306.

⁵⁸ Hirshleifer et al. show that a stock incorporates new earnings-related information more slowly if there are contemporaneous earnings announcements made by other firms on the same day. See D. Hirshleifer, S. S. Lim and S. H. Teoh (2009), “Driven to Distraction: Extraneous Events and Underreaction to Earnings News,” *The Journal of Finance* 64(5), pp. 2289–2325.

⁵⁹ See, e.g., L. Cohen and D. Lou (2012), “Complicated Firms,” *Journal of Financial Economics* 104(2), pp. 383–400.

⁶⁰ See, e.g., D. W. Diamond and R. E. Verrecchia (1987), “Constraints on Short-Selling and Asset Price Adjustment to Private Information,” *Journal of Financial Economics* 18(2), pp. 277–311 at p. 277 (“Prohibiting traders from shorting reduces the adjustment speed of prices to private information, especially to bad news.”).

⁶¹ E. M. Miller (1977), “Risk, Uncertainty, and Divergence of Opinion,” *The Journal of Finance* 32(4), pp. 1151–1168 (“Miller (1977)”) at p. 1160 (“The result is that short sales increase the supply of stock on the market by the amount of the outstanding short position. On Figure 1 the effect of short sales is to move the vertical supply curve to the right by the amount of the outstanding short position, lowering the price. This causes the existence of adverse opinions to affect the market value of that stock.”).

⁶² R. A. Brealey, S. C. Myers, and F. Allen (2011), *Principles of Corporate Finance*, 10th ed., New York, NY: McGraw-Hill (“Brealey et al. (2011)”), p. 327.

arbitrageurs to exploit market inefficiencies.⁶³ For example, high borrowing costs can make it difficult for short sellers to profit from their strategy, thereby impeding the ability of investors to sell stocks short.⁶⁴ Such frictions can reduce the efficiency of the market for a stock by, for example, reducing the speed with which information is incorporated into prices,⁶⁵ and may ultimately result in inefficient markets for affected securities.

39. An example of inefficiency for a stock traded on a major exchange is described in an academic study by Professors Huberman and Regev, which shows large and statistically significant stock price reactions to the release of stale news that had previously been made public.⁶⁶ Specifically, Bristol-Myers Squibb, a widely followed NYSE-traded firm with a market capitalization over \$100 billion at the time, was in a partnership with EntreMed, which had achieved an apparent breakthrough in cancer research.⁶⁷ Although this breakthrough had been reported in various news outlets, including in *The New York Times*, more than five months previously, when the result was mentioned on the front page of *The New York Times*, not only did EntreMed experience a price increase of more than 300%, Bristol-Myers Squibb experienced a return of 3.12% (corresponding to an increase in market capitalization of \$3.3 billion).⁶⁸ Subsequent to the study by Professors Huberman and Regev, research by Professor Tetlock confirmed that, inconsistent with market efficiency, re-publication of stale news sometimes has a price impact.⁶⁹

⁶³ Miller (1977), p. 1166; O. A. Lamont and R. H. Thaler (2003), "Can the Market Add and Subtract? Mispricing in Tech Stock Carve-Outs," *Journal of Political Economy* 111(2), pp. 227–268 ("Lamont and Thaler (2003)"); P. A. C. Saffi and K. Sigurdsson (2011), "Price Efficiency and Short Selling," *The Review of Financial Studies* 24(3), pp. 821–852 ("Saffi and Sigurdsson (2011)"); D. Duffie, N. Garleanu, and L. H. Pedersen (2002), "Securities Lending, Shorting, and Pricing," *Journal of Financial Economics* 66(2–3), pp. 307–339 ("Duffie, Garleanu and Pedersen (2002)").

⁶⁴ Lamont and Thaler (2003), pp. 256–257 ("First, there is the cost of actually finding shares to borrow. Second, as discussed in Liu and Longstaff (2000) and Mitchell et al. (2002), short sellers are required to post additional collateral if the price of [the shorted stock] rises. Third, as discussed in Mitchell et al., there is 'buy-in' risk, the fact that the [stock's] lender has the right to recall his loan at any time. If the [stock's] lender decides to sell his shares after they have risen in price, the short sellers may be forced to close their position at a loss if they are unable to find other shares to borrow. Fourth, even if the loan is not recalled, the cost of shorting could increase if the rebate changes.").

⁶⁵ See, e.g., Saffi and Sigurdsson (2011), pp. 847–849 ("Our main contribution is to present evidence that a high level of equity lending supply and ... small loan fees are associated with an increase in the speed with which information is incorporated into prices ... Firms with limited lending supply and high loan fees are slower to respond to market-wide shocks, according to measures drawn from Hou and Moskowitz (2005), Bris, Goetzmann, and Zhu (2007), and Griffin, Kelly, and Nardari (2009).").

⁶⁶ G. Huberman and T. Regev (2001), "Contagious Speculation and a Cure for Cancer: A Nonevent that Made Stock Prices Soar," *The Journal of Finance* 56(1), pp. 387–396 ("Huberman and Regev (2001)") at p. 387.

⁶⁷ Huberman and Regev (2001), pp. 392, 394.

⁶⁸ EntreMed also experienced a large abnormal return following *The New York Times* publication. Specifically, EntreMed experienced a "Friday-close-to-Monday-close return of 330 percent [which] was highly unusual: bigger than all but two of the over 28 million daily returns of stocks priced at \$3 or more between January 1, 1963, and December 31, 1997." Huberman and Regev (2001), pp. 391, 394.

⁶⁹ P. C. Tetlock (2011), "All the News That's Fit to Reprint: Do Investors React to Stale Information?" *The Review of Financial Studies* 24(5), pp. 1481–1512. Deviations from efficiency such as this can be found in other academic studies the finance literature.

40. Given the evidence of market frictions discussed in the academic literature, even for stocks that trade on major exchanges, it is not sufficient for a financial economist to presume market efficiency, to infer market efficiency from one period to another or from one security to another (even related) security, or to infer market efficiency from typical characteristics of securities that trade on major exchanges. Market efficiency must instead be empirically tested for individual securities during specific periods of time.

VI. Dr. Feinstein Fails to Reliably Establish that the Market for Cassava’s Common Stock Was Efficient During the Proposed Class Period

41. As I describe in **Section VI.A**, Dr. Feinstein’s analysis with respect to market efficiency for Cassava’s common stock consists of a “collective event study” that Dr. Feinstein asserts provides evidence of a cause-and-effect relationship between information about Cassava and the Company’s stock price. Based on this analysis, in addition to analyses of seven other *Cammer* and *Krogman* factors, Dr. Feinstein concludes that “the market for Cassava stock was an efficient market throughout the entire Class Period.”⁷⁰

42. However, as discussed in **Section VI.B**, applying Dr. Feinstein’s “collective event study” to dates with high social media activity provides evidence of potential inefficiency. The Feinstein Report fails to address market commentary that attributed some of the large movements in Cassava’s price to “meme traders” and some business press articles that explicitly characterized Cassava as a “meme stock,” a phenomenon that has raised serious questions among academics, regulators, and market participants about market efficiency for certain well-known retail-focused stocks in recent years.

43. Using Dr. Feinstein’s “collective event study” framework, I find that there is a concentration of statistically significant price movements on days with high social-media activity but deemed as “non- or lesser-news” or “ordinary” days by Dr. Feinstein.⁷¹ Moreover, the “incidence of statistical significance” for this group of days is statistically indistinguishable from that of Dr. Feinstein’s “news days,” suggesting that Cassava’s stock price was as frequently moving in the absence of new, value-relevant information and/or that the construction of Dr. Feinstein’s “collective event study” is unreliable. On the majority of

⁷⁰ Feinstein Report, ¶ 186.

⁷¹ As discussed in **Section VI.A**, Dr. Feinstein presents three different event study models, which produce three different sets of residual returns and t-statistics (to determine statistical significance) for each day during the Proposed Class Period. My use of the results from his models in this report is for illustrative purposes only and should not be considered an endorsement of his methodology or his results.

the high social media days I analyze, my review has not identified any new, value-relevant, public information that could explain the price movement in a manner consistent with market efficiency. Dr. Feinstein's failure to address such evidence inconsistent with market efficiency using his own criteria renders his analysis and conclusion on market efficiency unreliable.

44. Additionally, as discussed in **Section VI.C**, despite describing the eight *Cammer* and *Krogman* factors he analyzes as "generally accepted and widely used indicia of market efficiency,"⁷² his analysis of these factors similarly suffers from various flaws. Similar to his cause-and-effect analysis, with respect to his analysis of other *Cammer* and *Krogman* factors, Dr. Feinstein fails to address evidence that does not support a conclusion of market efficiency based on his own criteria. For example, Dr. Feinstein ignores constraints in the number of Cassava shares available for borrowing by short sellers and has conducted no analysis on the costs of short selling for Cassava's stock, or addressed the potential implications of such costs on market efficiency. Likewise, Dr. Feinstein fails to address the implications of low analyst coverage for periods of the Proposed Class Period, particularly in light of the reasons analysts articulated for dropping coverage.

A. Summary of Dr. Feinstein's Market Efficiency Analyses for Cassava's Common Stock

45. In his report, Dr. Feinstein expresses his understanding that "market efficiency is relevant to a securities case because it addresses the question of whether false information (e.g., in the form of an alleged misrepresentation or omission) would likely have impacted the prices at which investors bought and sold securities, and upon which investors relied."⁷³

46. Dr. Feinstein cites numerous legal rulings related to a conception of market efficiency he refers to as "informational efficiency."⁷⁴ He states that "market efficiency means that material public information is not ignored by the market, but rather is considered by market participants, and is incorporated and reflected in the trading prices of securities with reasonable promptness."⁷⁵

⁷² Feinstein Report, ¶ 18.

⁷³ Feinstein Report, ¶ 65.

⁷⁴ Feinstein Report, ¶ 57.

⁷⁵ Feinstein Report, ¶ 58.

47. Dr. Feinstein purports to “assess whether the market for Cassava stock was efficient during the Class Period” by “focusing on the *Cammer* and *Krogman* factors.”⁷⁶ Specifically, he analyzes the five factors discussed in *Cammer v. Bloom*: “1) trading volume, 2) coverage by securities analysts, 3) number of market makers, 4) eligibility for Form S-3 registration, and 5) empirical evidence that the security price reacts to new, company-specific information.”⁷⁷ Additionally, he analyzes the three factors discussed in *Krogman v. Sterritt*, “1) the company’s market capitalization, 2) the stock’s float, and 3) the typical bid-ask spread.”⁷⁸ Citing primarily to caselaw, he describes these eight factors as “generally accepted and widely used indicia of market efficiency.”⁷⁹ For each of these factors, Dr. Feinstein’s discussion addresses the entire three-year Proposed Class Period as a whole.

48. For his analysis of the fifth *Cammer* factor, Dr. Feinstein conducts what he refers to as a “collective event study.”⁸⁰ He describes the fifth *Cammer* factor as “empirical evidence showing a cause-and-effect relationship between the release of company-specific information and movements in the stock price.”⁸¹ However, to address this factor, Dr. Feinstein does *not* conduct an event study as implemented in the peer-reviewed academic literature, which estimates how the market for a stock reacts to a specific piece of information.⁸² Instead, he purports to assess whether “a company’s news events collectively exhibit a significantly greater frequency of statistically significant stock price movements than do non- or lesser-news days.”⁸³

⁷⁶ Feinstein Report, ¶ 77.

⁷⁷ Feinstein Report, ¶ 67.

⁷⁸ Feinstein Report, ¶ 72.

⁷⁹ Feinstein Report, ¶ 18. From an economic perspective, an analysis of stock price reaction to new, value-relevant information is the direct test of the semi-strong form of market efficiency. I do not take issue with the notion that the first four *Cammer* factors, the *Krogman* factors, or the other factors might be considered. Rather, Dr. Feinstein has no reliable basis in financial economics to draw an inference that would establish market efficiency based on these factors alone.

⁸⁰ Feinstein Report, ¶ 128.

⁸¹ Feinstein Report, ¶ 120.

⁸² Professor Craig MacKinlay summarizes the essence of the event study approach as follows: “Using financial market data, an event study measures the impact of a specific event on the value of a firm.” Prof. MacKinlay explains that the “initial task of conducting an event study is to define the event of interest and identify the period over which the security prices of the firms involved in this event will be examined—the event window.” Typically, event studies use a regression model to isolate the firm-specific stock price change after controlling for market-wide and/or industry-wide factors. Using this estimated relationship, it is possible to calculate the firm’s expected return on any given day based on that day’s market and/or industry index returns. Intuitively, the firm’s expected return is the return one would predict on a particular day based on the typical relationship between the stock’s return and the market and industry indices. The difference between a stock’s actual return and its expected return estimated from the regression model is called the stock’s “residual” return. In an event study, a statistically significant residual return over a given event window reflects the estimated stock price impact of the total mix of information released during that event window. An event study is helpful to assess whether the totality of new information arriving to the market over a specific event window affected the stock price. See C. MacKinlay (1997), “Event Studies in Economics and Finance,” *Journal of Economic Literature* 35(1), pp. 13–39 at p. 13.

⁸³ Feinstein Report, ¶ 128. Apart from the issues with Dr. Feinstein’s analysis discussed in this section, I note that the analysis of a cause-and-effect relationship between company information and stock prices he offers is a

49. In his selection of “news events” on which to conduct his “collective event study,” Dr. Feinstein states that “the finance literature recognizes that for certain companies, analysts and investors focus more on product development milestones rather than financial results.”⁸⁴ He therefore “examine[s] news events reported by the Company in Form 8-K filings, and the news events that commanded the broadest attention from the news media.”⁸⁵ Dr. Feinstein ultimately uses three alternative definitions of “news events”: (1) “all events reported by the Company in 8-K filings during the Class Period,” (2) all 8-K event dates excluding earnings announcement dates, and (3) “top news article count” days.⁸⁶ Specifically for the last category, Dr. Feinstein selects his “top news article count” days by identifying the set of days which “composed the 5% of all days that had the most published articles mentioning Cassava,” obtained exclusively from Factiva,⁸⁷ and asserts that these are the “days during the Class Period that had the heaviest news media coverage of Cassava.”⁸⁸

50. Next, Dr. Feinstein conducts a regression analysis to “isolate[] the residual return” for Cassava’s stock after accounting for “market-wide and industry sector factors”⁸⁹ (using the Nasdaq Biotechnology Index to account for industry developments) and determines whether the residual return was statistically significant on each day during the Proposed Class Period.⁹⁰ He compares the frequency of statistically significant days on “news event days” to “non- or lesser-news days”, stating that “[a] higher incidence of statistically significant returns on news event dates relative to all other dates indicates that Cassava stock responded to information and thereby demonstrated market efficiency.”⁹¹ Dr. Feinstein finds that, for each of his three models,⁹² “there was a much higher frequency of statistically significant Cassava stock returns on the [news] days as compared to all other more ordinary days.”⁹³

mechanical exercise, which neither accounts for whether a stock price change would be *expected* (i.e., whether the news release provided new, value-relevant information), nor assesses directional consistency of new information and stock returns.

⁸⁴ Feinstein Report, ¶ 133.

⁸⁵ Feinstein Report, ¶ 136.

⁸⁶ Feinstein Report, ¶¶ 137–138, Section VIII.B.3.c.

⁸⁷ Factiva is a “business intelligence platform” whose “unrivaled content set includes newspapers, magazines, journals, websites, blogs, market research and multimedia formats from credible, reliable sources.” See “What is Factiva?,” *Dow Jones*, available at <https://www.dowjones.com/professional/glossary/factiva/>. Factiva does not directly capture social media activity among its sources.

⁸⁸ Feinstein Report, ¶ 141.

⁸⁹ Feinstein Report, ¶ 126. Dr. Feinstein’s analysis uses “one-year rolling regressions.” See Feinstein Report, ¶ 161.

⁹⁰ Feinstein Report, ¶¶ 156, 165.

⁹¹ Feinstein Report, ¶ 170.

⁹² In the remainder of my report, I refer to the three regression models that deploy Dr. Feinstein’s three alternative definitions of “news event” days as his “8-K,” “8-K without Earnings Announcements,” and “Top Article Count” event study models, as relevant.

⁹³ Feinstein Report, ¶ 180.

B. Applying Dr. Feinstein’s “Collective Event Study” to Dates with High Social Media Activity Provides Evidence of Potential Inefficiency

51. In his “collective event study” analysis, Dr. Feinstein tests whether Cassava’s “news events collectively exhibit a significantly greater frequency of statistically significant stock price movements than do non- or lesser-news days.”⁹⁴ While he represents that such a test could “establish[] that the stock consistently reacts to company-specific information,”⁹⁵ he does not test whether the stock exhibits “non-reaction to non-information,”⁹⁶ or alternatively whether the stock appears to react to stale or non-value-relevant information, which would raise questions about the efficiency of the market, as discussed in **Section V**. Put another way, in an efficient market, one would not expect to observe a concentration of statistically significant returns on days without new, value-relevant information.

52. However, as discussed below in **Section VI.B.1**, Cassava was discussed in the public press alongside popular meme stocks such as GameStop (“GME”), which have been known to experience large stock price movements associated with social media activity, even absent new value-relevant information about the company. Moreover, Cassava experienced a large increase in social media attention during the Proposed Class Period, which, during certain periods within the Proposed Class Period, is comparable to meme stocks analyzed in the academic literature; experienced large price movements that significantly exceeded broader market movements; and was classified as a “meme stock” in a financial index of meme stocks.

53. Consequently, in **Section VI.B.2**, I investigate days that Dr. Feinstein classified as “non- or lesser-news days” or referred to as “ordinary days” in his deposition,⁹⁷ but on which Cassava was most frequently mentioned on social media. Based on my analysis, I find that there is a concentration of statistically significant price movements on these days with high social-media activity but deemed as “non- or lesser-news days” by Dr. Feinstein.⁹⁸ Moreover, the “incidence of statistical significance” for this group of days is statistically

⁹⁴ Feinstein Report, ¶ 128.

⁹⁵ Feinstein Report, ¶ 128.

⁹⁶ Shleifer (2000), p. 5.

⁹⁷ Feinstein Deposition, 75:21–76:1 (“My test identified a bucket of days that reasonably had a higher flow of information than ordinary days, and it did it three different ways, and then tested to see whether the high information days more frequently exhibited statistical significance than the ordinary days. And every time it did.”).

⁹⁸ As discussed in **Section VI.A**, Dr. Feinstein presents three different event study models, which produce three different sets of residual returns and t-statistics (to determine statistical significance) for each day during the Proposed Class Period. My use of the results from his models in this report is for illustrative purposes only and should not be considered an endorsement of his methodology or his results.

indistinguishable from that for the 8-K Events, 8-K Events Excluding Earnings Announcements, and Top Article Count Events.⁹⁹

54. As discussed in **Section VI.B.3**, to confirm Dr. Feinstein’s classification of the high social media days as “non- or lesser news days,” I have additionally reviewed the press articles and analyst reports cited by Dr. Feinstein, as well as the most “influential” social media posts,¹⁰⁰ on these dates that are associated with statistically significant stock returns. On the majority of these dates, my review also has not identified any new, value-relevant, public information that could explain the statistically significant price movements in a manner consistent with market efficiency.

1. **Cassava Was Characterized by Some Market Participants as Being Impacted by the Meme Stock Phenomenon During the Proposed Class Period**

55. Dr. Feinstein testified in his deposition that Cassava “wasn’t one of those stocks that’s often referred to as a meme stock.”¹⁰¹ However, as discussed below, during the Proposed Class Period, Cassava was described by market participants as being affected by the “meme stock phenomenon,” with some commentators explicitly characterizing Cassava as a “meme stock.” Moreover, Cassava also shared some attributes of other stocks that have been impacted by the meme phenomenon, including heightened social media attention and outsized stock price movements. Indeed, as discussed below, during the Proposed Class Period Cassava was in fact included in a financial index tracking the returns of meme stocks.

56. By means of background, primarily in 2021, market commentators began using the term “meme stock” to describe stocks exhibiting unusual trading behavior that coincided with considerable attention on social media and online investing forums.¹⁰² In particular, January 2021 has been recognized by market participants as the first peak in meme stock trading. Stocks such as GME and AMC Entertainment Holdings, Inc. (“AMC”) became widely

⁹⁹ Feinstein Report, ¶ 173.

¹⁰⁰ I access historical tweets and Reddit posts via a database maintained by Brandwatch Consumer Research. Given the large volume of social media posts on some of the High Social Media Days, I focus my review on the 100 Reddit posts and 100 tweets on each date with the highest “Reddit Score” and “Impressions”, respectively, which are available through the Brandwatch database. Twitter “Impressions” are a measure of the number of views on a post. A “Reddit Score” is the number of upvotes minus the number of downvotes. See “Complete Guide to Measure Metrics,” *Social Media Management* (“Impressions ... The lifetime number of views on the post.”); “Frequently Asked Questions,” Reddit, available at <https://www.reddit.com/wiki/faq/> (“A submission’s score is simply the number of upvotes minus the number of downvotes.”).

¹⁰¹ Feinstein Deposition, 39:7–39:20.

¹⁰² An article studying how investment ideas spread on social media explains that a meme is “an idea that becomes a fad and spreads by means of imitation in a social network.” See L. H. Pedersen (2022), “Game On: Social Networks and Markets,” *Journal of Financial Economics* 146(3), pp. 1097–1119 at p. 1112.

discussed on social media and experienced extreme price increases, with GME experiencing an approximately 2,700% increase from its intraday low on January 8, 2021 to its intraday high on January 28, 2021,¹⁰³ and AMC increasing by more than 300% on January 27, 2021 alone.¹⁰⁴

57. Following this incident, market commentators described meme stocks as stocks characterized by high levels of enthusiasm from investors on social media and online platforms such as Reddit and Twitter,¹⁰⁵ which could lead to dramatic swings in prices and increases in trading volume.¹⁰⁶ While meme stocks received significant attention in early 2021, the phenomenon was not limited to this period. As the *New York Times* noted in 2022 amid one of several resurgences in meme stock trading, “once thought to be a short-lived phenomenon, it appears the wild trading in so called meme stocks is here to stay.”¹⁰⁷ More recently, GME’s price surged nearly 75% on May 13, 2024 after “Roaring Kitty,” “an account associated with a social media finance influencer credited with sparking the 2021 meme stock rally” posted on social media for the first time in three years.¹⁰⁸

58. The trading behavior of meme stocks has also been assessed by academics as likely inconsistent with market efficiency. As discussed in **Section V**, in an efficient market, one should observe “non-reaction to non-information.”¹⁰⁹ Meme stocks, on the other hand, can experience extremely large stock price movements that occur in the absence of new, value-relevant public information (*i.e.*, information that would inform investors about the prospects/expected future cash flows of a company) that could justify such movements.¹¹⁰

¹⁰³ “Staff Report on Equity and Options Market Structure Conditions in Early 2021,” U.S. Securities and Exchange Commission, October 14, 2021 (“SEC Staff Report”), p. 19.

¹⁰⁴ SEC Staff Report, p. 22.

¹⁰⁵ I use “Twitter” to refer to the website currently known as “X” throughout this report, as it was known as Twitter during the majority of the Proposed Class Period and is referred to as Twitter in the Supplemented Consolidated Complaint. See, e.g., Supplemented Consolidated Complaint, ¶ 24.

¹⁰⁶ See, e.g., “Here’s What Investment Gurus Including Michael Steinhardt and Jeremy Siegel Say About The Meme Stock Bubble,” *Forbes*, January 31, 2021.

¹⁰⁷ “Meme Stocks Are Back. Here’s Why Wild Trading May Be Here to Stay,” *The New York Times*, August 19, 2022.

¹⁰⁸ “GameStop Soars as Flag Bearer ‘Roaring Kitty’ Resurfaces, Sparks Meme Stock Rally,” *Reuters*, May 13, 2024.

¹⁰⁹ Shleifer (2000), p. 5.

¹¹⁰ For example, following the large price movements beginning in January 2021, several companies released statements that they were unaware of changes in their business conditions that would explain such price movements. See, e.g., GameStop Corp., Form 10-K for FY 2020, filed March 23, 2021, p. 15 (“Stock markets in general and our stock price in particular have recently experienced extreme price and volume fluctuations that have often been unrelated or disproportionate to the operating performance of those companies and our company. ... During this time, we have not experienced any material changes in our financial condition or results of operations that would explain such price volatility or trading volume.”); “BlackBerry Comments on Trading Activity at Request of the Industry Regulatory Organization of Canada,” *BlackBerry*, January 25, 2021, available at <https://www.blackberry.com/us/en/company/newsroom/press-releases/2021/blackberry-comments-on-trading-activity-at-request-of-the-industry-regulatory-organization-of-canada> (“The Company is not aware of any material,

Professor Fama—who won a Nobel Prize for his work on market efficiency—commented that “for a couple of days, the market [for GameStop] was *very inefficient*.”¹¹¹ Similarly, Professor Malkiel, a professor of finance at Princeton University, referred to the meme stock bubble as a “speculative mania.”¹¹² An academic paper investigating the meme stock episode in January 2021 found “evidence that in the case of coordinated trading by a large crowd of retail traders that results in a short squeeze, market quality and market efficiency are subsequently reduced.”¹¹³

59. The Feinstein Report has no discussion of the meme stock phenomenon and whether there was any impact of this phenomenon on the efficiency of the market for Cassava’s stock. In his deposition, Dr. Feinstein asserted that “there’s no consensus on what the definition of a meme stock is and there’s no consensus as to how to interpret the behavior of the stocks that are thusly identified.”¹¹⁴ Nevertheless, after being notified in the weeks before his deposition that “defendants might try to make an argument that Cassava stock was inefficient because it was a, quote/unquote, meme stock,” Dr. Feinstein asked an assistant to “check [the] frequency of mention[s] of Cassava on Reddit and count those numbers and compare them to the frequency of other stocks mentioned on Reddit.”¹¹⁵ Dr. Feinstein found that Cassava “was not discussed as frequently as GameStop, for example, or AMC,” and therefore “thought Reddit was sufficient to establish that the stock was not being discussed on social media at the same high level and with the same frequency as the stocks that are often put into this bucket of undefined meme stocks.”¹¹⁶ Dr. Feinstein apparently took “comfort” that the “analysis [he] did is complete and comprehensive given the facts about this company.”¹¹⁷

undisclosed corporate developments and has no material change in its business or affairs that has not been publicly disclosed that would account for the recent increase in the market price or trading volume of its common shares.”); Nokia Corp., Form 6-K, filed January 27, 2021 (“Nokia is not aware of any material, undisclosed corporate developments or material change in its business or affairs that has not been publicly disclosed that would account for the recent increase in the market price or trading volume of its shares.”).

¹¹¹ “Nobel Winner Eugene Fama on GameStop, Market Bubbles and Why Indexing Is King,” *MarketWatch*, March 3, 2021 (emphasis added). In his deposition, Dr. Feinstein stated that he continued to hold Prof. Fama in “high regard.” See Feinstein Deposition, 84:20–84:25.

¹¹² “Here’s What Investment Gurus Including Michael Steinhardt and Jeremy Siegel Say About The Meme Stock Bubble,” *Forbes*, January 31, 2021 (“It’s the same phenomenon as the Dutch going crazy in the 1600s buying tulip bulbs. It’s happened time and time again. These speculative manias are likely to be a fact of life forever... In some sense like a game of musical chairs, there’s somebody who’s going to be left standing.’ ... ‘It is a speculative craze sparked by social media.’”).

¹¹³ F. Allen et al. (2023), “Squeezing Shorts Through Social Media Platforms,” Working Paper, available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3823151 (“Allen et al. (2023)”).

¹¹⁴ Feinstein Deposition, 28:16–28:25.

¹¹⁵ Feinstein Deposition, 26:3–27:25.

¹¹⁶ Feinstein Deposition, 33:12–34:6. Dr. Feinstein explained that he discussed these results orally with his assistant and did not document his findings. See Feinstein Deposition, 34:7–34:19.

¹¹⁷ Feinstein Deposition, 35:6–35:13.

60. Dr. Feinstein’s cursory analysis, even taken at face value, would not have addressed the fact that business press publications such as the *Financial Times* and *Bloomberg* attributed some of the large movements in Cassava’s price to “meme traders” and some business press articles explicitly characterized Cassava as a “meme stock” in 2021:

- a. “Shares in the small drug developer Cassava Sciences fell as low as 24 per cent on Friday after almost soaring 700 per cent this year to become the top stock in the Nasdaq Composite index, *as past trading caps imposed on so-called meme stocks pushed factions of day traders into the biotech realm.*”¹¹⁸
- b. “Behind this meteoric rise [of Cassava Sciences] is a combination of optimism for its early-stage Alzheimer’s drug and *the frenzy of retail day trading* that has characterized the pandemic. The company is the third biggest gainer this year behind GameStop Corp. and AMC Entertainment Holdings Inc. in the Russell 2000. ... *A biotech plus the meme stock crowd is a combustible mix.* Drugmakers that have treatments still in early trials can be highly volatile while stocks like AMC and Gamestop have had their own share of price swings.”¹¹⁹
- c. “With biotech having trailed the broader market for the past three months and chock full of companies that have been the focus of short sellers, *it was catnip for the Reddit crowd.* ... *Retail traders have also been driving triple-digit and even quadruple-digit gains in obscure biotech names like ... Cassava Sciences Inc.,* a 20-year old biotech whose main product isn’t yet in the final stages of testing.”¹²⁰
- d. “Short sellers betting against *meme stock Cassava* have made \$100 million over the past month.”¹²¹
- e. “Biotech company Cassava Sciences SAVA is *known for its shares rocketing to extreme heights after becoming a meme stock in 2021...*”¹²²

61. Consistent with the discussions in the business press, a Cantor Fitzgerald securities analyst that covered Cassava noted in July 2021 that “[b]ased on our diligence, we believe

¹¹⁸ “Global Stocks Rise for Best Week Since November,” *Financial Times*, February 5, 2021 (emphasis added).

¹¹⁹ “Drugmaker With No Product Gains 911% on Alzheimer’s, Meme Hopes,” *Bloomberg*, June 8, 2021 (emphasis added).

¹²⁰ “Biotech Finds Market Love at Last as Meme Traders, FDA Converge,” *Bloomberg*, June 11, 2021 (emphasis added).

¹²¹ “Short Sellers Betting Against Meme Stock Cassava Have Made \$100 million Over the Past Month,” *Business Insider*, August 31, 2021 (emphasis added).

¹²² “Short Sellers Hit Back at Cassava Lawsuit,” *MarketWatch*, November 4, 2022 (emphasis added).

that the current valuation is, in part, being fueled by shorter-horizon investors, who comprise over 60% of ownership.”¹²³

62. Moreover, similar to stocks that have been categorized as meme stocks, Cassava had “frequent mentions on social media, including Reddit”¹²⁴ during the Proposed Class Period. Cassava experienced increased enthusiasm, or higher levels of attention, on social media and online investing platforms such as Reddit and Twitter in 2021, beginning with the height of the meme stock phenomenon. **Exhibit 1A** shows aggregate daily Reddit mentions of “SAVA” before and during the Proposed Class Period. After averaging fewer than two mentions per day on Reddit from July 2020 to December 2020, Cassava averaged over 50 per day for 2021. In aggregate, Cassava was mentioned over 19,000 times in 2021 and over 33,000 times during the Proposed Class Period on Reddit. Similarly, **Exhibit 1B** plots daily Twitter mentions of “SAVA,” before and during the Proposed Class Period, which exhibit a similar pattern to the Reddit mentions. The Company averaged fewer than 40 mentions per day on Twitter from July 2020 to December 2020, compared with more than 160 per day for 2021. In aggregate, Cassava was mentioned over 59,000 times in 2021 and over 148,000 times during the Proposed Class Period on Twitter.

63. Cassava was also recognized as one of the top-mentioned stocks on the WallStreetBets Reddit page at various points during 2021.¹²⁵ WallStreetBets is an online forum where retail investors discuss stock and option trading and has been closely associated with the meme phenomenon.¹²⁶ Social media posts referencing “SAVA” included discussions of short squeezes, comparisons between Cassava and other meme stocks, and recommendations that other investors buy Cassava’s stock.¹²⁷

¹²³ “AAIC’21 Data May Bode Well for Simu’ Clinical Success with Time, but Priced for Perfection?” *Cantor Fitzgerald*, July 14, 2021, p. 1.

¹²⁴ SEC Staff Report, pp. 16–17. *See also* Allen et al. (2023).

¹²⁵ *See, e.g.*, “Meme Stocks Are Riding a Wave of Reddit Enthusiasm Again, as Traders Cheer Fresh Gains in GameStop, AMC, and BlackBerry,” *Business Insider*, August 25, 2021 (“Among the most hyped stocks on Wall Street Bets — Reddit’s 10-million strong forum — were GameStop, which was mentioned 1,900 times in the last 24 hours, ... BlackBerry was also mentioned 355 times as well as Clover Health and Cassava Sciences.”); “These Are the 10 Most Popular Stocks on Reddit’s WallStreetBets Forum,” *Business Insider*, December 21, 2021.

¹²⁶ *See* “WallStreetBets Reddit Group: What Is It?” *CoinDesk*, January 28, 2021 (“The group ‘r/Wallstreetbets’ (aka WSB) is a longstanding subreddit channel where over 3.5 million Reddit users discuss highly speculative trading ideas and strategies. Described as ‘like 4chan found a Bloomberg Terminal,’ the community has caused huge disruption to financial markets this week.”). *See* “What are communities or ‘subreddits’?,” *Reddit*, available at <https://support.reddithelp.com/hc/en-us/articles/204533569-What-are-communities-or-subreddits> (“Reddit is a large community made up of thousands of smaller communities. These smaller, sub-communities within Reddit are also known as ‘subreddits’ and are created and moderated by redditors...”).

¹²⁷ *See, e.g.*, “@Ultra_Calls \$SAVA did what holders were hoping \$AMC and \$GME would do. Thanks for this fantastic call. <https://t.co/xlSeR3NK2o>,” *Twitter*, February 3, 2021, 9:35 PM, available at <http://twitter.com/garyelgringo/statuses/1357080347578613760>, “Buying the dip on SAVA 🚀🚀🚀🚀 holding my

64. In his deposition, Dr. Feinstein asserted that Cassava “just was not discussed as frequently as GameStop, for example, or AMC” based on a search on Reddit.¹²⁸ However, Dr. Feinstein provided no support for why (only) those two stocks constitute an appropriate benchmark for determining what stocks “are often put into this bucket of undefined meme stocks,”¹²⁹ or for what constitutes elevated levels of social media activity.

65. In contrast to Dr. Feinstein’s conclusion that Cassava is not comparable to stocks that “are often put into this bucket of undefined meme stocks,”¹³⁰ I find that social media activity related to Cassava during certain periods within the Proposed Class Period is comparable to meme stocks analyzed in the academic literature. Specifically, a paper by Professor Franklin Allen and co-authors studying the “‘meme’ stocks,” which were “at the center of the social media discussions” during the January 2021 episode, analyzed the “combined daily Mentions on Reddit, Stocktwits, and Twitter.”¹³¹ The authors found that over the “period January 11, 2021 through January 26, 2021,” when the meme stocks experienced sharp price run-ups that led to a “short squeeze” and trading restrictions imposed by various brokerage firms, the median number of daily mentions in this stock price run-up period among the seven stocks they classify as meme stocks that experienced a short squeeze was 752.¹³² By comparison, mentions of Cassava on Reddit and Twitter (*i.e.*, without also including Stocktwits, which are included in the Allen study) exceeded 752 daily mentions multiple times during the Proposed Class Period. For example, Cassava was mentioned an average of 1,701 times per day in the first week of February 2021, and experienced similar spikes in mentions during August 2021, November 2021, February 2022, and September 2022.¹³³

GME and AMC and NOK not advice. Clue bird,” Reddit, February 3, 2021, 5:28 PM, available at https://www.reddit.com/r/wallstreetbets/comments/lby4ji/what_are_your_moves_tomorrow_february_04_2021/glx23tq/; “We need a piece of news from \$SAVA, like a potential partnership announcement from a bigpharma like \$PFE, to continue a \$CAR like short squeeze, as well as shake off the weak hands & traders. Stay strong & long 🐦.” Twitter, November 2, 2021, 7:50 PM, available at <http://twitter.com/LuoshengPeng/statuses/1455623367306919936>.

¹²⁸ Feinstein Deposition, 33:17–33:20 (“Q. What did Mr. Avila report back to you? A. I can’t remember exactly, but that it just was not discussed as frequently as GameStop, for example, or AMC.”). Dr. Feinstein did not provide any documentation or backup for the search he described in his deposition.

¹²⁹ Feinstein Deposition, 34:2–34:6.

¹³⁰ Feinstein Deposition, 34:2–34:6.

¹³¹ Allen et al. (2023), Table A5. The seven stocks are Gamestop, AMC, American Airlines, Bed Bath and Beyond, Express, Naked, and Tootsie Roll.

¹³² Allen et al. (2023), Table A5.

¹³³ See Exhibit 1A and Exhibit 1B. Combined average daily Twitter and Reddit mentions for SAVA were 1,701 from February 1, 2021 to February 5, 2021; 951 from August 23, 2021 to August 27, 2021; 1,584 from November 1, 2021 to November 5, 2021; 811 from February 7, 2022 to February 11, 2022; and 1,087 from September 19, 2022 to September 23, 2022. I note that the social media activity for the seven stocks in the Allen study increased further on January 27, 2021 and the week that followed as the stocks were subject to a short squeeze and trading restrictions imposed by various brokerage firms. Nonetheless, the period leading up to January 27, 2021 was characterized by heightened social media activity accompanied by large, sudden price run-ups for

66. As further confirmation that some market participants considered Cassava to be a meme stock, Cassava was in fact included in the Solactive Roundhill Meme Stock Index—a financial index that tracked the returns of stocks classified as meme stocks—at various points during the Proposed Class Period.¹³⁴ The index, which was created in November 2021, consisted of 25 U.S. listed equity securities that exhibited “a combination of *elevated social media activity* and high short interest.”¹³⁵

67. Additionally, also similar to other meme stocks, Cassava’s stock experienced “large price move[ment]s ... that significantly exceeded broader market movements.”¹³⁶ As shown in **Exhibit 2**, Cassava’s price at the beginning of 2021 was only \$7.09. Over the next seven months, it experienced a return of more than 1800% to reach a peak of \$135.30 on July 28, 2021. As reported in the public press articles discussed above, at one point during that stretch, Cassava was one of the top three gaining stocks in the Russell 2000, along with GME and AMC.¹³⁷

68. In addition to being large in magnitude, Cassava’s price movements during the Proposed Class Period were also correlated with other stocks with large retail followings. To evaluate this relationship, I added the returns from the Goldman Sachs Retail Favorites Index, net of market and industry movements,¹³⁸ to Dr. Feinstein’s event study model as a third explanatory variable (in addition to his market and industry indices). The Goldman Sachs Retail Favorites Index tracks US equities with high volume on retail brokerage platforms.¹³⁹

these stocks. See e.g., Allen et al. (2023), Figure 1 and p. 8 (“Some short sellers, such as Citron Research, engaged publicly in an attempt to persuade the crowd that going long in these stocks was not a prudent investment strategy. Retail traders were not discouraged. On the contrary: after Citron Research’s posts, there was a marked uptick in social media activity for GameStop across Twitter, Stocktwits, and Reddit (see Figure 1). ... On January 19, Citron Research, an ‘online stock commentary source’ (and at the time short in GameStop), published a post on Twitter that effectively called buyers of GameStop’s stock ‘suckers’ and promised to explain ‘the 5 reasons GameStop \$GME buyers at these levels are the suckers at this poker game.’”). See also SEC Staff Report, pp. 16–18 (“[I]n January 2021, more than 100 stocks experienced large price moves or increased trading volume the significantly exceeded broader market movements. ... Price increases, trading interest, and social media interest all accelerated in 2021 ... Media attention on GME increased with the January 11 announcement that Mr. Cohen, of Chewy, would join the GameStop board of directors.”).

¹³⁴ The earliest date with constituent data available for the index was December 1, 2021. The index is rebalanced every two weeks and Cassava was included as a constituent from December 1, 2021 to December 7, 2021, January 5, 2022 to February 1, 2022, and August 31, 2022 to October 25, 2022. See *Bloomberg*.

¹³⁵ *Bloomberg*; “MEME ETF Launches,” *PR Newswire*, December 8, 2021 (emphasis added). See also, “Roundhill and Solactive Capture Social Media Sentiment with MEME ETF,” *Solactive*, December 8, 2021. Cassava’s high levels of short interest during the Proposed Class Period are discussed in **Section VI.C.1**.

¹³⁶ SEC Staff Report, pp. 16–17. See also Allen et al. (2023).

¹³⁷ “Drugmaker With No Product Gains 911% on Alzheimer’s, Meme Hopes,” *Bloomberg*, June 8, 2021 (“The company is the third biggest gainer this year behind GameStop Corp. and AMC Entertainment Holdings Inc. in the Russell 2000.”).

¹³⁸ The returns for the Goldman Sachs Retail Favorites Index are orthogonalized with respect to Dr. Feinstein’s market and industry indices, using the same 252-day rolling control period and dummy variables for dates identified by Dr. Feinstein as 8-K news days.

¹³⁹ See, e.g., “Today’s Stock Market Is the Exception, Not the Rule,” *Finimize* (“Goldman Sachs’ ‘retail favorites’ index – a measure of the 50 or so stocks most frequently owned by individuals...”).

As shown in **Exhibit 3A**, the coefficient on the Retail Favorites Index is statistically significant and positive for the majority of the Proposed Class Period, indicating a statistically significant relationship between Cassava and other stocks popular with retail traders.¹⁴⁰⁻¹⁴¹ In other words, beyond being affected by developments in the market as a whole and the biotech industry, Cassava was also affected by developments that affected other stocks classified as retail-focused stocks or meme stocks during the Proposed Class Period.

69. In sum, Dr. Feinstein's assertion that Cassava was not impacted by the meme stock phenomenon because it "wasn't one of those stocks that's often referred to as a meme stock"¹⁴² ignores market commentary during the Proposed Class Period and is unsupported by any reliable analysis. Contrary to Dr. Feinstein's claim, I find that social media activity related to Cassava during the Proposed Class Period sometimes reached a level comparable to the median of a set of meme stocks during the stock price run-up period that led to the "short squeezes" analyzed in academic literature. Moreover, Cassava was included in a financial index identifying meme stocks, was explicitly characterized as a meme stock in the business press, experienced returns that were correlated with those of other meme stocks during the Proposed Class Period (after controlling for market and industry developments) and, similar to other meme stocks, experienced price movements during the Proposed Class Period that far exceeded broader market movements. As I discuss in the following sections, Dr. Feinstein's failure to reliably assess the implications of the meme stock phenomenon, and the related evidence potentially inconsistent with market efficiency, renders his conclusion of market efficiency unreliable.

¹⁴⁰ Note that I take the Feinstein 8-K event study model as given for the purpose of this analysis and add to it the Goldman Sachs Retail Favorites Index. My use of the Dr. Feinstein's event study model is for illustrative purposes only and should not be considered an endorsement of his methodology or his results. Rather, my approach shows that the Retail Favorites Index appears to be a missing factor in his analysis that captures systematic movements in Cassava's stock price. The coefficient of the Index lacks statistical significance early in the Proposed Class Period because of the 252-day estimation period used in the Feinstein event study models that fails to capture abrupt changes in exposures to risk factors in a timely fashion.

¹⁴¹ I conducted further sensitivities of this analysis using data for the Solactive Roundhill Meme Stock Index discussed in ¶ 66. First, I added the returns for the Solactive Roundhill Meme Stock Index, net of market and industry movements, to Dr. Feinstein's event study model as a third explanatory variable, instead of the Goldman Sachs Retail Favorites Index. As shown in **Exhibit 3B**, the coefficient on the Solactive Roundhill Meme Stock Index is statistically significant and positive for the portion of the Proposed Class Period with available data. Because returns for the index are not available before November 10, 2021, the first coefficient in the exhibit is November 10, 2022 (due to Dr. Feinstein's 252-day estimation period). Second, to account for the lag in available data for the index, I pulled return data for the 24 companies included in the Solactive Roundhill Meme Stock Index on December 1, 2021 (the first day for which constituent data available through Bloomberg). I did not include Cassava, although it was included in the index on December 1, 2021. I then constructed an equal-weighted index using these 24 companies to estimate coefficients throughout the Proposed Class Period. As shown in **Exhibit 3C**, the coefficient on the equal-weighted index of these 24 companies is statistically significant for the majority of the Proposed Class Period.

¹⁴² Feinstein Deposition, 39:7–39:20.

2. Dr. Feinstein’s “Collective Event Study” Fails to Account for a Concentration of Statistically Significant Price Movements on Days with High Social Media Activity

70. Despite the fact that stocks impacted by the meme phenomenon have experienced large stock price movements that occur in the absence of new, value-relevant public information, Dr. Feinstein fails to consider the implications of Cassava’s heightened social media attention in his analysis of *Cammer* Factor 5.

71. As discussed in **Section VI.A**, Dr. Feinstein’s analysis consists of a “collective event study” which purports to establish “a cause-and-effect relationship” between new information and Cassava’s stock price.¹⁴³ To establish this relationship, Dr. Feinstein “focuses on a group of news events that would include the events that were valuation-relevant to the Company,”¹⁴⁴ using his three sets of “news days.” He further claims that his “news event dates ... reasonably identif[y] the days of Cassava’s most important news during the Class Period” by relying “on the news media to identify the most important news days.”¹⁴⁵ He then studies the proportion of statistically significant returns among these “news days” as compared to the other “non- or lesser-news days”, or as he referred to in his deposition, “ordinary” dates.¹⁴⁶

72. I use Dr. Feinstein’s analytical framework to assess the implications of days during the Proposed Class Period on which Cassava experienced heightened social media attention. Specifically, as I explain in the remainder of this section, I have identified a group of days which Dr. Feinstein characterizes as “non- or lesser-news days” or “ordinary days” but on which Cassava had elevated social media attention (which I will refer to as “High Social Media Days”). My analysis further finds that these High Social Media Days—even though deemed as “non- or lesser-news” and “ordinary” days by Dr. Feinstein—are associated with a frequency of statistically significant stock price movements that is not statistically different than that of Dr. Feinstein’s so-called “news days.” Indeed, the frequency of statistically significant stock returns for this group of High Social Media Days is much higher compared with that of other “non- or lesser-news days.”

73. As discussed above, Cassava was characterized by some market participants as being impacted by the meme stock phenomenon during the Proposed Class Period, and Cassava experienced heightened social media attention, particularly in 2021. To evaluate the potential

¹⁴³ Feinstein Report, ¶ 128.

¹⁴⁴ Feinstein Report, ¶ 136.

¹⁴⁵ Feinstein Report, ¶ 142.

¹⁴⁶ Feinstein Deposition, 156:23–157:1.

implications for Dr. Feinstein's *Cammer* Factor 5 analysis, I first identify a set of High Social Media Days by considering days which were identified as "non- or lesser news days" in all three of Dr. Feinstein's event study models during the Proposed Class Period. I then remove any impact dates identified by Plaintiffs as associated with alleged misrepresentations or alleged corrective disclosures. From these dates, I identify the 5% of days with the most social media mentions (consistent with Dr. Feinstein's treatment of article count dates for his Top Article Count event study).¹⁴⁷

74. Using these criteria, I identify 34 High Social Media Days. As shown in **Exhibit 4A**, nine of these 34 High Social Media Days (26.5%) are associated with statistically significant price movements at the 95% confidence level using Dr. Feinstein's 8-K and 8-K without Earnings Announcements event study models, and 10 of these 34 (29.4%) are associated with statistically significant price movements using Dr. Feinstein's Top Article Count event study model.¹⁴⁸ Applying the same Fisher Exact test used by Dr. Feinstein, I find that these High Social Media Days are associated with a higher proportion of statistically significant price movements than the remaining "non- or lesser-news days," as shown in **Exhibit 4A**.

75. Moreover, I find that the proportion of statistically significant price movements on the High Social Media Days are comparable to that on Dr. Feinstein's "news days." Specifically, I compare the frequency of significant returns on these High Social Media Days to the frequency of significant returns using Dr. Feinstein's different classifications of "news days." Applying Dr. Feinstein's Fisher Exact test, **Exhibit 4B** shows that the proportion of statistically significant price movements on these High Social Media Days—even though deemed as containing "non-or lesser-news"—is statistically indistinguishable from the proportion of any of Dr. Feinstein's three sets of "news days."

76. For a stock that trades in an efficient market, Dr. Feinstein states that one would expect to find that "a company's news events collectively exhibit a significantly greater frequency of statistically significant stock price movements than do non- or lesser-news days."¹⁴⁹ In his deposition, Dr. Feinstein also affirmed that the days he classifies as "news days" in his report reflected a "rich sample of important news events" that "have a higher

¹⁴⁷ I rank the "non- or lesser-news days" by number of social media mentions using the counts of Reddit and Twitter mentions presented in **Exhibit 1A** and **Exhibit 1B**, respectively.

¹⁴⁸ The 10 High Social Media Days are September 18, 2020, February 3, 2021, February 4, 2021, February 5, 2021, June 11, 2021, July 21, 2021, July 30, 2021, November 2, 2021, September 20, 2022, and September 22, 2022. The return on June 11, 2021 is only statistically significant in Dr. Feinstein's Top Article Count event study model. The other dates are significant in all three of Dr. Feinstein's event study models. See Feinstein Report, Exhibits 16–18.

¹⁴⁹ Feinstein Report, ¶ 128.

flow of news than do ordinary days.”¹⁵⁰ He claimed that he also looked at days with statistically significant returns but not classified as “news days,”¹⁵¹ which apparently did not lead to any adjustment to his analysis. However, the existence of a group of “ordinary,” “non- or lesser-news days” (*i.e.*, the High Social Media Days) that also “exhibit a significantly greater frequency of statistically significant stock price movements” than other “non- or lesser-news days” is inconsistent with the inference Dr. Feinstein attempts to draw from his collective test.¹⁵²

77. Indeed, such a finding could indicate that (1) the stock price was often moving in the absence of new, value-relevant information, which would be inconsistent with market efficiency;¹⁵³ or, alternatively, (2) that the construction of Dr. Feinstein’s “collective event study” is deficient and flawed, or both. Either interpretation would render Dr. Feinstein’s conclusion regarding market efficiency unreliable, *i.e.*, his “collective event study” cannot reliably “prove that the Cassava stock price responded to Company-specific information during the Class Period,” which he recognizes as “the hallmark of an efficient market.”¹⁵⁴

78. Additionally, although Dr. Feinstein claimed that assessing whether “the stock price is moving wildly with no good reason for moving wildly” is not something he did because such an assessment evaluates fundamental value efficiency,¹⁵⁵ he also perplexingly claimed in his deposition that “the range [of] prices [for Cassava’s stock] could easily be explained as being rational and efficient.”¹⁵⁶ I have not seen any specific explanation or backup data supporting

¹⁵⁰ Feinstein Deposition, 156:17–157:20 (“[W]hat’s important is that the collection of events in the news sample has a richer, more concentrated set of -- of news days than does the ordinary -- than do all other days, the ordinary days. ... Q And the screen or the selection of events that you constructed here, do you believe it accomplished that objective of achieving a richer collection of high-information flow days? A Definitely. I mean, I did it two different ways to assure that. To assure that whether it was the company reporting what they thought were the high-news days or the news media reporting what they thought were the high-news days that the qualitative result would be ... consistent.”).

¹⁵¹ Feinstein Deposition, 171:11–171:25.

¹⁵² Feinstein Report, ¶ 128.

¹⁵³ Shleifer (2000), p. 5.

¹⁵⁴ Feinstein Report, ¶ 123.

¹⁵⁵ Feinstein Deposition, 143:8–143:20. See also Feinstein Deposition, 49:18–49:25 (“[T]he form of efficiency that the courts care about and that I’m testing here is what’s called informationally efficient -- informational efficiency, not fundamental efficiency”). He stated that fundamental efficiency “define[s] efficiency as conforming to a particular valuation.” See Feinstein Deposition, 50:2–50:16.

¹⁵⁶ Feinstein Deposition, 29:5–29:10 (“I had in mind, are these stock movements unreasonable? Are they irrational? Is the range of stock price movements for Cassava something that can’t be explained rationally? And it was pretty apparent from the outset that the range and prices could easily be explained as being rational and efficient.”). See also Feinstein Deposition, 30:16–31:8 (“The only relevance that [meme] comparison would have on an assessment of market efficiency is if there were some factors that were making the price of Cassava -- Cassava’s stock range outside of any reasonable valuation. And it was very easy to assess that that just wasn’t the case here.”). Dr. Feinstein did not describe specific analysis that made it “easy to assess” that the range of Cassava’s stock price during the Proposed Class Period was not “outside of any reasonable valuation.”

Dr. Feinstein's analysis that the "range [of Cassava's stock] prices" was "rational and efficient."

3. The Majority of Statistically Significant High Social Media Days are Not Associated with New, Value-Relevant Information

79. Even though Dr. Feinstein classifies the High Social Media Days as days that have "non- or lesser news," I investigated the possibility that the high proportion of statistically significant returns on these dates was caused by new information about Cassava. However, based on my review of the information released on the 10 High Social Media Days associated with statistically significant returns in at least one of Dr. Feinstein's event study models, it appears that there is no new information in any of the press articles and analyst reports cited by Dr. Feinstein, or discussed in social media, that could explain the stock price change for at least seven of the 10 days in a manner consistent with market efficiency.¹⁵⁷ In fact, on some of these days, it appears that the stock price is reacting to the discussion of stale information, which is inconsistent with market efficiency.

80. To analyze these dates, I first reviewed the sources that Dr. Feinstein provided as part of his analysis. Dr. Feinstein has identified reports by "five different analyst firms" during the Proposed Class Period, which he states provided "broad analyst coverage" of Cassava.¹⁵⁸ For each of the High Social Media Days, I have reviewed analyst reports released on each day and the following seven calendar days. Dr. Feinstein has also identified "1,440 articles published about the Company during the Class Period" from a "search of the Factiva

¹⁵⁷ The remaining three dates are September 18, 2020, July 30, 2021, and September 20, 2022. After market hours on September 17, 2020, "the company disclosed that its CFO Eric Schoen bought 10,000 shares of the company at \$7.03 per share and in another transaction, the company's director purchased 213,719 shares at \$6.98 per share." See "Stock Alert: Cassava Sciences Soars 25%," *RTT News*, September 18, 2020, FEINSTEIN_0003541. During market hours on July 30, 2021, an article with commentary on Cassava's clinical trial results was published. See "Alzheimer's scientists critique Cassava Sciences' study results — overblown, inappropriate, uninterpretable," *STAT+*, July 30, 2021. On September 20, 2022, a social media post made public a rumored letter from the SEC that referenced a "case closing recommendation" in response to a Freedom of Information Act Request regarding Cassava. See "\$SAVA SEC Case Closing Recommendation Made. Per SEC Guidelines Case Closing Recommendation is made when 'no enforcement action will be recommended' and 'so resources can be redirected to investigations that will be more productive.'" See SEC enforcement [sic] manual," *Twitter*, September 20, 2022 9:45 AM ET, available at <https://x.com/TCBBIO/status/1572220312653303811>. The results reported in **Exhibit 4A** and **Exhibit 4B** do not change if I exclude these dates from the analysis. Specifically, if I reduce the number of statistically significant High Social Media Days by three, I still find that the proportion of statistically significant residual returns on High Social Media Days is significantly greater than on the remaining "non- or lesser-news days" and statistically indistinguishable from the proportion of any of Dr. Feinstein's three sets of "news days."

¹⁵⁸ Feinstein Report, ¶¶ 84–86. In addition to the analyst reports produced by Dr. Feinstein, I supplemented the analyst reports I reviewed by acquiring reports available to me through the *Capital IQ* and *Refinitiv Eikon* databases.

database,” including published news articles and press releases.”¹⁵⁹ For each of the High Social Media Days, I have reviewed public press released on each day and the prior trading day. Finally, I have reviewed a set of the most influential posts on Reddit (including on WallStreetBets) and Twitter from each date to supplement Dr. Feinstein’s sources.¹⁶⁰

81. I summarize my findings from the review of news on these dates below.

82. **February 3, 4, and 5, 2021:** Dr. Feinstein’s analysis has not identified any new, value-relevant information on these days. Based on my review, I have not identified any new, value-relevant information to explain the statistically significant residual return of 45.89% on February 3 or the statistically significant residual returns of -34.00% on February 4 and -35.22% on February 5.¹⁶¹ These returns occur on the three dates following February 2, on which Cassava issued a press release publishing the interim analysis of its open-label study at approximately 8:30 AM.¹⁶²⁻¹⁶³ From February 3 through February 5, there were no analyst reports published that provided further information to supplement this news.¹⁶⁴ The only news articles identified by Dr. Feinstein’s Factiva search on these dates either re-published the news from the press release or comment on Cassava’s price movements without providing new, value-relevant information about the Company.¹⁶⁵ I do not identify

¹⁵⁹ Feinstein Report, ¶ 91.

¹⁶⁰ As noted above, given the large volume of social media posts on some of the High Social Media Days, I focused my review on the 100 Reddit posts and 100 tweets on each date with the highest “Reddit Score” and “Impressions”, respectively, which are available through the Brandwatch database.

¹⁶¹ Residuals reported are from Dr. Feinstein’s Top Article Count date event study model. Dr. Feinstein estimates residual returns of 45.69%, 45.72%, and 45.89% on February 3, 2021, -35.45%, -35.40%, and -34.00% on February 4, 2021, and -37.36%, -37.34%, and -35.22% on February 5, 2021, in his 8-K, 8-K without Earnings Announcements, and Top Article Count event study models, respectively. These three dates have statistically significant returns across all three of Dr. Feinstein’s event study models. See Feinstein Report, Exhibits 16–18.

¹⁶² “Cassava Sciences’ Simufilam Improves Cognition and Behavior in Alzheimer’s Disease in Interim Analysis of Open-label Study,” *GlobeNewswire*, February 2, 2021, FEINSTEIN_0003739. Dr. Feinstein identifies February 2, 2021 as a “news day,” but does not identify February 3, 4, or 5 as “news days” in any of his event study models. See Feinstein Report, Exhibits 13–15.

¹⁶³ As discussed in **Section V**, in an efficient market, security prices will rapidly adjust to reflect new, value-relevant, public information. Academic literature has shown that stock prices react to new information usually within a day, but it could be in a matter of minutes. See, e.g., T. Chordia, R. Roll, and A. Subrahmanyam (2008), “Liquidity and Market Efficiency,” *Journal of Financial Economics* 87(2), pp. 249–268; J. A. Busse and T. C. Green (2002), “Market Efficiency in Real Time,” *Journal of Financial Economics* 65(3), pp. 415–437.

¹⁶⁴ Cantor Fitzgerald published an analyst report following the announcement at 1:15 PM on the afternoon of February 2, 2021, which was the only analyst I identified that published a report with substantive commentary. Cantor Fitzgerald also published a summary of research titled “Cantor Daily Research Highlights” during pre-market hours on February 3 which repeats the information in its report from February 2. See “OLE Interim and Recent FDA Meeting Increases Awareness of Possible P3 in 2H21 for Oral Simufilam, Awaiting Details,” *Cantor Fitzgerald*, February 2, 2021, FEINSTEIN_0002114; “Cantor Daily Research Highlights,” *Cantor Fitzgerald*, February 3, 2021. The next analyst report was published two weeks later, when H.C. Wainwright and Maxim both published reports on February 16, 2021. See Dr. Feinstein Production Materials. The analyst for which Dr. Feinstein did not obtain analyst reports but which he identified as covering Cassava (B. Riley) did not initiate coverage until April 27, 2021. See Feinstein Report, ¶ 85 (“According to Refinitiv Eikon at least one other analyst firm, B. Riley Financial, followed the Company and published analyst reports.”). See also “Cassava Sciences initiated with a Buy at B. Riley,” *Theflyonthewall.com*, April 27, 2021, FEINSTEIN_0004083.

¹⁶⁵ See Dr. Feinstein Production Materials.

any new, value-relevant information discussed in social media commentary that has not been identified in Dr. Feinstein's sources.

83. **June 11, 2021**: Dr. Feinstein's analysis has not identified any new, value-relevant information on this day. Based on my review, I have not identified any new, value-relevant information to explain the statistically significant residual price increase of 15.30% on this date in one of Dr. Feinstein's event study models.¹⁶⁶ No analyst reports were published on this date or on the following seven days. The articles identified by Dr. Feinstein's Factiva search report on Cassava's price movements without providing new information about the Company.¹⁶⁷ I do not identify any new, value-relevant information discussed in social media commentary that has not been identified in Dr. Feinstein's sources.

84. **July 21, 2021**: Dr. Feinstein's analysis has not identified any new, value-relevant information on this day. Based on my review, I have not identified any new, value-relevant information to explain the statistically significant residual price increase of 24.51% on this date.¹⁶⁸ On this date, Cassava issued a press release announcing that the Company would be making two presentations at the upcoming AAIC conference on July 26 and July 29.¹⁶⁹ However, the fact that Cassava would be giving these presentations had been announced by Cassava previously in a press release on June 21, 2021.¹⁷⁰

85. An analyst report from Maxim Group on July 22, 2021 previewing the conference quoted this portion of the press release:

Upcoming AAIC presentation. On 7/21, Cassava announced that two new datasets on its lead asset, simulfilam, [sic] will be presented at the upcoming AAIC. On 7/26, a poster presentation, titled "SavaDx, a Novel Plasma Biomarker to Detect Alzheimer's Disease, Confirms Mechanism of Action of Simufilam" will be presented, followed by an

¹⁶⁶ Residuals reported are from Dr. Feinstein's Top Article Count date event study model. Dr. Feinstein estimates residual returns of 14.77%, 14.81%, and 15.30% on June 11, 2021, in his 8-K, 8-K without Earnings Announcements, and Top Article Count event study models, respectively. Dr. Feinstein's residual return was statistically significant in his Top Article Count event study model. See Feinstein Report, Exhibits 16–18.

¹⁶⁷ One article attributed Cassava's price increases that week to news about "[t]he approval of Biogen Inc.'s controversial Alzheimer's disease therapy" which occurred on June 7, 2021, four days prior. See "Rival Firm's Drug Approval Sparks Lilly Stock Jump," *Indianapolis Business Journal*, June 11, 2021, FEINSTEIN_0004198.

¹⁶⁸ Residuals reported are from Dr. Feinstein's Top Article Count date event study model. Dr. Feinstein estimates residual returns of 23.63%, 23.56%, and 24.51% on July 21, 2021, in his 8-K, 8-K without Earnings Announcements, and Top Article Count event study models, respectively. The residual return on this date was statistically significant across all three of Dr. Feinstein's event study models. See Feinstein Report, Exhibits 16–18.

¹⁶⁹ "Cassava Sciences to Present New Clinical Dataset at 2021 Alzheimer's Association International Conference," *GlobeNewswire*, July 21, 2021, FEINSTEIN_0004311.

¹⁷⁰ "Press Release: Cassava Sciences Provides Mid-Year Corporate Update, Clinical Development Progress and Announces Guidance on Clinical Data Release," *Dow Jones Institutional News*, June 21, 2021, FEINSTEIN_0004245.

oral presentation on 7/29, on the much-anticipated 9-month cognition data from the ongoing open-label, P2b extension study (N=150) in AD.

In addition to the cognition data, the following biomarker analyses are also anticipated at AAIC: Biomarkers of Alzheimer's disease: amyloid beta42, total tau, P-tau181; Biomarkers of neurodegeneration: neurogranin, neurofilament light change (NfL); Biomarkers of neuroinflammation: YKL-40, sTREM2, HMGB1.¹⁷¹

86. The information that Cassava would be presenting its 9-month cognition data from the open label study and data on SavaDX had already been released by the Company in a press release on June 21, 2021:

Cassava Sciences plans to announce results of an interim analysis on safety and cognition for the first 50 subjects to complete 9 months of open-label drug treatment. These cognition data will be presented at the 2021 Alzheimer's Association International Conference (AAIC) in Denver, CO, the week of July 26-30(th). The scientific committee of AAIC has invited the Company's scientists to present these data as an oral presentation.

Cassava Sciences will also present at AAIC biomarker data from the open-label study, including: -- Biomarkers of Alzheimer's disease: amyloid beta42, total tau, P-tau181. -- Biomarkers of neurodegeneration: neurogranin, neurofilament light chain (NfL). -- Biomarkers of neuroinflammation: YKL-40, sTREN.2 and HMGB1.

Update on SavaDx: SavaDx is an investigational diagnostic candidate to detect Alzheimer's disease with a simple blood test. SavaDx was evaluated for its ability to detect treatment effects of simufilam versus placebo in a randomized, controlled study completed in 2020. This was a Phase 2b study that enrolled 64 patients with Alzheimer's disease. The SavaDx clinical dataset will be presented at AAIC the week of July 26-30(th).¹⁷²

¹⁷¹ "Still Catching Your Breath from Aducanumab? Not So Fast, Now it's AAIC Time," *Maxim Group*, July 21, 2021, FEINSTEIN_0002014 (emphasis removed). The Maxim Group report was the only analyst report released following the press release on July 21, 2021 and prior to the presentation of the 9-month cognition data on July 26, 2021. See Dr. Feinstein Production Materials. I note there was a report from H.C. Wainwright that was released pre-market on July 20, 2021, raising Cassava's price target. See "Cassava Sciences Is Maintained at Buy by HC Wainwright & Co," *Dow Jones Institutional News*, July 20, 2021 6:33 ET, FEINSTEIN_000430; "06:25 EDT Cassava Sciences Price Target Raised to \$124 from \$97 at H.C.," *Theflyonthewall.com*, July 20, 2021, FEINSTEIN_0004310.

¹⁷² "Press Release: Cassava Sciences Provides Mid-Year Corporate Update, Clinical Development Progress and Announces Guidance on Clinical Data Release," *Dow Jones Institutional News*, June 21, 2021, FEINSTEIN_0004245.

87. Additionally, indications that the data presented would be positive were already public. For example, an article from Seeking Alpha published before market hours the previous day highlighted statements made by CEO Remi Barbier much earlier, on April 28, 2021 and June 8, 2021:

Based upon numerous interactions, we've never encountered a more bullish (yet credible) CEO and are therefore questioning whether their data will be well above baseline, which would be the 1st time ever, or potentially a substantial improvement from the 6-month data. CEOs of public companies don't make these kinds of statements unless they can back it up. Consider these quotes:

Founder/CEO Remi Barbier at the B. Riley Securities Neuroscience conference on 4/28/21: I won't spill the beans on the 9-month data, but we are pretty excited about what we are seeing right now.

Remi Barbier Fortune interview published on 6/8/21 (Barbier owns over 1M shares currently worth >\$100 million): I know the science, I know the data, I know the disease, and this stuff looks promising and I'm putting my money where my mouth is.¹⁷³

88. The re-publication of information about the AAIC presentations on July 21, 2021 would not be expected to cause a statistically significant price reaction in an efficient market. Therefore, based on my review, I have not identified any new, value-relevant information to explain the statistically significant price increase on this date in a manner consistent with market efficiency.¹⁷⁴

89. **November 2, 2021**: Dr. Feinstein's analysis has not identified any new, value-relevant information on this day. Based on my review, I have not identified any new, value-relevant information to explain the statistically significant residual price increase of 21.60% on this date.¹⁷⁵ No analyst reports were published on this date.¹⁷⁶ The articles identified by

¹⁷³ "Cassava Sciences Is on The Brink Of Making Medical History," *Seeking Alpha*, July 20, 2021, 7:43 AM ET.

¹⁷⁴ One article published on July 20, 2021 reports on a Form 4 filing. See "Cassava Sciences Inc. - Insider Trading Report (SEC Filing - 4)," *U.S. Securities and Exchange Commission*, July 20, 2021, FEINSTEIN_0004305. After market hours on July 20, 2021, a Form 4 was filed reporting that CEO Remi Barbier exercised options. The Form 4 states that "transaction represents exercise of stock options for cash." See Cassava Sciences, Inc., Form 4, filed July 20, 2021.

¹⁷⁵ Residuals reported are from Dr. Feinstein's Top Article Count date event study model. Dr. Feinstein estimates residual returns of 21.44%, 21.39%, and 21.60% on November 2, 2021, in his 8-K, 8-K without Earnings Announcements, and Top Article Count event study models, respectively. The residual return on this date was statistically significant return across all three of Dr. Feinstein's event study models. See Feinstein Report, Exhibits 16–18.

¹⁷⁶ There were two analyst reports published during the subsequent seven days, both of which discussed information released on November 4, 2021. See "When Doubt Has Come, Stand by Me(chanism of Action) With

Dr. Feinstein's Factiva search do not provide any new, value-relevant information about the Company.¹⁷⁷ I have not identified any new, value-relevant information discussed in social media commentary that has not been identified in Dr. Feinstein's sources.

90. **September 22, 2022:** Dr. Feinstein's analysis has not identified any new, value-relevant information on this day. Based on my review, I have not identified any new, value-relevant information to explain the statistically significant residual price increase of 31.87% on this date, as the re-publication of information would not be expected to cause a statistically significant price increase in an efficient market.¹⁷⁸ On this date, Cassava's price increase was attributed by the public press to a rumored report that the "SEC reached a 'five-page case-closing recommendation'" in its investigation of Cassava.¹⁷⁹ Dr. Feinstein's Factiva search identifies an article on September 22, 2022 titled "Cassava Rockets After SEC Reportedly Clears It Of Tampering With Alzheimer's Data," which states that "Seeking Alpha published a document showing the SEC reached a 'five-page case-closing recommendation.'" ¹⁸⁰

91. However, the report of the apparent "case closing recommendation" (including the same screenshot of the SEC response to the Freedom of Information Act request which was included in the Seeking Alpha article) had been released in a tweet on Tuesday, September 20, 2022 at 9:45AM, which was widely accessible and viewed.¹⁸¹ The re-publication of this

Simufilam; Reiterate 2021 Top Pick Buy," *H.C. Wainwright*, November 4, 2021, FEINSTEIN_0001883; "No Evidence of Data Manipulation" by J of Neuroscience," *Jones Research*, November 4, 2021, FEINSTEIN_0000374.

¹⁷⁷ For example, the article "Artificial Intelligence Could Be About to Replace Your Doctor" lists Cassava as one of the companies "[m]entioned in today's commentary," however, the mention of Cassava only contains a description of the company. See "Artificial Intelligence Could Be About to Replace Your Doctor," *GlobalInvestmentDaily.com*, November 2, 2021, FEINSTEIN_0005167. Another article mentioned that the company was trending on social media. See "What's Up With Cassava Sciences Flying Today?" *Benzinga*, November 2, 2021, FEINSTEIN_0005173 ("Cassava Sciences Inc (NASDAQ: SAVA) shares are trading up Tuesday as traders were able to push the stock higher. The stock has been trending on social media sites such as StockTwits throughout the day.").

¹⁷⁸ Residuals reported are from Dr. Feinstein's Top Article Count date event study model. Dr. Feinstein estimates residual returns of 31.81%, 31.90%, and 31.87% on September 22, 2022, in his 8-K, 8-K without Earnings Announcements, and Top Article Count event study models, respectively. The residual return on this date was statistically significant return across all three of Dr. Feinstein's event study models. See Feinstein Report, Exhibits 16–18.

¹⁷⁹ "Cassava Rockets After SEC Reportedly Clears It of Tampering with Alzheimer's Data," *Investor's Business Daily*, September 22, 2022, FEINSTEIN_0006032.

¹⁸⁰ "Cassava Rockets After SEC Reportedly Clears It of Tampering with Alzheimer's Data," *Investor's Business Daily*, September 22, 2022, FEINSTEIN_0006032. Seeking Alpha does not appear to be included in the *Factiva* database that Dr. Feinstein used to obtain "published news articles and press releases," as his production materials do not contain the Seeking Alpha article referenced in *Investor's Business Daily*. See Feinstein Report, ¶ 91. See also "The SEC Recommends Closing Cassava Sciences Investigation," *Seeking Alpha*, September 22, 2022, available at <https://seekingalpha.com/article/4542335-sec-recommends-closing-cassava-sciences-investigation>.

¹⁸¹ See "\$SAVA SEC Case Closing Recommendation Made. Per SEC Guidelines Case Closing Recommendation is made when 'no enforcement action will be recommended' and 'so resources can be redirected to investigations that will be more productive.'" See SEC enforcement [sic] manual," *Twitter*, September 20, 2022 9:45 AM ET, available at <https://x.com/TCBIO/status/1572220312653303811>. Based on my search of the Brandwatch database, this tweet had more than 33,000 impressions, which ranked 34th among tweets I

information on September 22, 2022 would not be expected to cause a statistically significant price reaction in an efficient market. Therefore, based on my review, I have not identified any new, value-relevant information to explain the statistically significant price increase on this date.

92. Similar to Dr. Feinstein's failure to address whether Cassava's stock exhibits "non-reaction to non-information," he also fails to discuss the content of the information released on his "news days," despite stating in his deposition that he had conducted an ex post review of such information after running his "collective event study".¹⁸² For example, on July 29, 2021 (identified as a "news day" in all three of Feinstein's event study models), Cassava's stock experienced a statistically significant negative residual return of 26.60%, according to Dr. Feinstein's event study model.¹⁸³ However, rather than carefully analyze the "cause-and-effect," Dr. Feinstein has not identified any negative information released on this date that would explain the statistically significant residual price decline.

93. On the morning of July 29, according to the business press, Cassava "announced positive clinical data ... from an interim analysis of an open-label study with simufilam," reporting that "simufilam significantly improved cognition in Alzheimer's patients, with no safety issues."¹⁸⁴ Analysts reacted positively to this news, and both analysts that published reports on this date raised their price targets.¹⁸⁵ In particular, Cantor Fitzgerald explained that its "price target change is the result of incrementally increasing our assumed probability of success to 60% from 55% due to, in our view, an incremental de-risking of the program based

identified on September 20, 2022. Dr. Feinstein estimates residual returns of 26.69%, 26.77%, and 26.78% on September 20, 2022, in his 8-K, 8-K without Earnings Announcements, and Top Article Count event study models, respectively. I also identify it as one of the 10 High Social Media Days with statistically significant returns. Dr. Feinstein estimates residual returns of -0.18%, -0.21%, and 0.25%, which were not statistically significant in any of Dr. Feinstein's three event study models, on September 21, 2022.

¹⁸² Feinstein Deposition, 167:20–167:23 ("Did you review the 8-Ks in every instance that your test identified a statistically significant change in the stock price? A. Yes.").

¹⁸³ Residuals reported are from Dr. Feinstein's Top Article Count date event study model. Dr. Feinstein estimates residual returns of -27.32%, -27.27%, and -26.60% on July 29, 2021, in his 8-K, 8-K without Earnings Announcements, and Top Article Count event study models, respectively. The residual return on this date was statistically significant across all three of Dr. Feinstein's event study models. See Feinstein Report, Exhibits 16–18.

¹⁸⁴ "Cassava Sciences Announces Positive Biomarker Data with Simufilam in Alzheimer's Disease," *GlobeNewswire*, July 29, 2021, FEINSTEIN_0004349.

¹⁸⁵ "Priced for Perfection, Given Known Unknowns in Alz Dis, but Simu' Activity Needs P3 Trials to Translate into Clinical Efficacy," *Cantor Fitzgerald*, July 29, 2021, FEINSTEIN_0001970; "Raising PT to \$215/BUY. 9-Month Data De-Risk 12-Month Data in 4Q21; Randomized Trial Data Could be in 1H/mid22," *Jones Trading*, July 29, 2021, FEINSTEIN_0000325. H.C. Wainwright published a report the following day and reiterated its Buy rating and \$124 price target, stating "with the pullback in the stock yesterday, believe Cassava shares represent an attractive buying opportunity." See "Better Than Expected 9-Month ADAS-Cog Results; Reiterate Buy and \$124 PT," *H.C. Wainwright*, July 30, 2021, FEINSTEIN_0001964.

on the presented data.”¹⁸⁶ Similarly, Jones Trading stated that “[f]ollowing positive 9-month cognition data, we are raising POS to 30% from 20%, raising market penetration to 25% from 15% and reducing discount rate to 23% from 25%.”¹⁸⁷ Dr. Feinstein does not reconcile how news that analysts reacted to by increasing their probability of success for simufilam would be associated with a statistically significant negative price decline.¹⁸⁸

94. In sum, Dr. Feinstein’s “collective event study” fails to account for the implications of the meme stock phenomenon on Cassava’s stock in his *Cammer* Factor 5 analysis. When considered together, these High Social Media Days represent a concentration of days identified by social media activity—rather than new, value-relevant company-specific news as Dr. Feinstein purports to identify—on which Cassava experienced statistically significant price movements. Dr. Feinstein’s failure to analyze, among other things, the relationship between social media activity and the statistically significant price movements on these “non- or lesser-news days” as part of his “cause-and effect” analysis, renders his conclusions regarding market efficiency unreliable.

C. For Other *Cammer* and *Krogman* Factors, Dr. Feinstein Fails to Address Evidence that Does Not Support a Conclusion of Market Efficiency, Based on His Own Criteria

95. In his deposition, Dr. Feinstein described the *Cammer* and *Krogman* factors other than *Cammer* Factor 5 as “dispositive indicators that the stock does trade efficiently.”¹⁸⁹ Dr. Feinstein’s analysis of the other *Cammer* and *Krogman* factors suffers from flaws and deficiencies as well. For example, Dr. Feinstein’s discussion of these other factors largely consists of calculating totals or averages over the Proposed Class Period as a whole. In doing so, he glosses over substantial changes in Cassava’s stock over the 37-month Proposed Class Period. Dr. Feinstein fails to analyze the constraints on the number of Cassava shares available for borrowing by a short seller or the costs of short selling Cassava’s stock, which were especially high during 2022. Likewise, Dr. Feinstein fails to address the implications of

¹⁸⁶ “Priced for Perfection, Given Known Unknowns in Alz Dis, but Simu’ Activity Needs P3 Trials to Translate into Clinical Efficacy,” *Cantor Fitzgerald*, July 29, 2021, FEINSTEIN_0001970.

¹⁸⁷ “Raising PT to \$215/BUY. 9-Month Data De-Risk 12-Month Data in 4Q21; Randomized Trial Data Could be in 1H/mid22,” *Jones Trading*, July 29, 2021, FEINSTEIN_0000325.

¹⁸⁸ As noted above, in his deposition, Dr. Feinstein agreed that the most important factor for investors of Cassava was the likelihood of approval and commercialization of the company’s drug candidate, Simufilam. See Feinstein Deposition, 137:8–137:12 (“Was the likelihood of approval and commercialization of the company’s drug candidate here, Simufilam, by far the most important factor for investors during the class period? A. Yes.”).

¹⁸⁹ Feinstein Deposition, 79:13–79:15 (“The other ones are probative and, in fact, dispositive indicators that the stock does trade efficiently.”).

low analyst coverage for periods of the Proposed Class Period, particularly in light of the reasons analysts articulated for dropping coverage.

1. Dr. Feinstein Fails to Analyze the Implications of High Borrowing Costs on the Ability of Arbitrageurs to Sell the Stock Short

96. As part of his analysis of *Cammer* Factor 3, Dr. Feinstein states that the “*Cammer* court cited the presence of arbitrageurs along with market makers as an indicator of market efficiency.”¹⁹⁰ He presents data on “stock short interest” to show that “there was considerable Cassava stock short-selling activity over the course of the Class Period” and states that this “short-selling activity evinces the presence of likely arbitrageur [sic] activity.”¹⁹¹

97. As discussed in **Section V**, short selling plays an important role in market efficiency, ensuring that public information is quickly and fully incorporated into prices, as short selling a stock allows an arbitrageur to profit from a decrease in the stock price. To sell a stock short, an investor must first borrow the stock from a lender in an equity lending market, for which an investor is charged a borrowing fee.¹⁹² Once the stock has been borrowed, it can be sold on the market. The investor benefits from a short sale when she closes the short position by buying the stock back in the market at a lower price than she sold it and delivers the stock to the stock lender.

98. As Dr. Feinstein notes, Cassava’s stock indeed experienced consistently high levels of short interest during the Proposed Class Period. As shown in **Exhibit 5**, Cassava’s level of short interest was above 20% of total shares outstanding for a majority of the Proposed Class Period (with an average of 23%). This level peaked at times above 30%, first between December 2021 and February 2022, and again in August and September 2022. Such levels of short interest are very high relative to the average stock, based on the evidence from academic literature. For example, an academic study by Professors Muravyev, Pearson, and Pollet analyzes a sample of U.S. equities over the period from July 2006 to August 2015 and finds that the 99th percentile level of short interest was 30.49% and the 90th percentile was 15.32%.¹⁹³

¹⁹⁰ Feinstein Report, ¶ 98.

¹⁹¹ Feinstein Report, ¶ 101.

¹⁹² Brealey et al. (2011), p. 327.

¹⁹³ D. Muravyev, N. D. Pearson, and J. M. Pollet (2022), “Is There a Risk Premium in the Stock Lending Market? Evidence from Equity Options,” *Journal of Finance* 77(3), pp. 1787–1828 (“Muravyev et al. (2022)”) at p. 1802. The Muravyev et al. (2022) sample includes U.S. equities that had exchange-traded options over the period from July 2006 to August 2015. See Muravyev et al. (2022), p. 1798.

99. Despite Dr. Feinstein acknowledging the importance of analyzing short sale and arbitrage activity, his analysis of this factor is deficient and flawed. Specifically, while Dr. Feinstein addresses the *presence* of short sellers in the market for Cassava's stock, he ignores potential constraints on the ability of existing and prospective short sellers to further borrow the stock in order to perform arbitrage functions, which is crucial for the market to function efficiently.

100. High costs, risks, and uncertainties associated with short selling can limit the ability of arbitrageurs to exploit market inefficiencies.¹⁹⁴ For example, high borrowing costs can make it difficult for short sellers to profit from their strategy, thereby limiting the incentive for arbitrageurs to sell stocks short.¹⁹⁵ Among other reasons, borrowing costs may be high when the supply of shares available to borrow is small. Fees for borrowing stock are generally low, but they can be substantial for some stocks for certain periods of time.¹⁹⁶ In particular, when most available shares have been lent out, academic research has shown additional shares are increasingly more difficult and costly to borrow.¹⁹⁷ Consistent with evidence from the academic literature, such constraints can impede market efficiency by, for example, hindering the process by which information is incorporated into prices.¹⁹⁸

101. Dr. Feinstein does not address evidence of such frictions for Cassava's stock during the Proposed Class Period, despite stating in his report that low trading costs for investors (represented by "narrow bid-ask spreads") "promote market efficiency."¹⁹⁹

102. In particular, Dr. Feinstein's partial analysis of short interest ignores that high levels of short interest, combined with depletion of available shares to borrow, can constrain the ability of arbitrageurs to sell additional shares short. As stated above, additional shares are

¹⁹⁴ Miller (1977), p. 1166; Lamont and Thaler (2003); Saffi and Sigurdsson (2011); Duffie, Garleanu and Pedersen (2002).

¹⁹⁵ Lamont and Thaler (2003), pp. 256–257 ("First, there is the cost of actually finding shares to borrow. Second, as discussed in Liu and Longstaff (2000) and Mitchell et al. (2002), short sellers are required to post additional collateral if the price of [the shorted stock] rises. Third, as discussed in Mitchell et al., there is 'buy-in' risk, the fact that the [stock's] lender has the right to recall his loan at any time. If the [stock's] lender decides to sell his shares after they have risen in price, the short sellers may be forced to close their position at a loss if they are unable to find other shares to borrow. Fourth, even if the loan is not recalled, the cost of shorting could increase if the rebate changes.").

¹⁹⁶ See, e.g., J. E. Engelberg, A. V. Reed, and M. C. Ringgenberg (2018), "Short-Selling Risk," *Journal of Finance* 73(2), pp. 755–786 ("Engelberg et al. (2018)") at pp. 762–763; Muravyev et al. (2022), p. 1802.

¹⁹⁷ A. C. Kolasinski, A. V. Reed, and M. C. Ringgenberg (2013), "A Multiple Lender Approach to Understanding Supply and Search in the Equity Lending Market," *Journal of Finance* 68(2), pp. 559–595 at pp. 578, 585.

¹⁹⁸ See, e.g., Saffi and Sigurdsson (2011), pp. 847–849 ("Our main contribution is to present evidence that a high level of equity lending supply and ... small loan fees are associated with an increase in the speed with which information is incorporated into prices ... Firms with limited lending supply and high loan fees are slower to respond to market-wide shocks, according to measures drawn from Hou and Moskowitz (2005), Bris, Goetzmann, and Zhu (2007), and Griffin, Kelly, and Nardari (2009).").

¹⁹⁹ Feinstein Report, ¶ 75.

increasingly more difficult and costly to borrow when most available shares have already been lent out. In his deposition, Dr. Feinstein agreed that a situation where “there’s just no shares to borrow” could be an impediment that restricts short selling in a way that’s inconsistent with an efficient market.²⁰⁰ Dr. Feinstein, however, claimed that even if it is “hard to borrow the stock for short selling purposes,” the argument that the difficulty might be “an impediment to short selling...doesn’t hold up.”²⁰¹ He effectively concluded that any constraints on short selling were not an issue for Cassava since it “wasn’t impossible to borrow and short sell the stock since there was so much of the short selling happening.”²⁰²

103. However, Dr. Feinstein’s reasoning is flawed as it only focuses on the existence of short sellers who were able to borrow shares in the past and maintain their existing short position, not the constraint faced by arbitrageurs who would consider shorting additional shares to incorporate negative information currently or in the future. His assertion is inconsistent with the academic literature, which clearly indicates that Cassava’s high level of short interest must be considered in the context of the number of shares available to be loaned and short-sale constraints. For example, Professors Saffi and Sigurdsson state that “[h]igh levels of short interest (i.e., high numbers of stocks sold short as a fraction of total shares outstanding) are generally interpreted as evidence of short-sale constraints.”²⁰³

104. Shares loaned to short sellers are typically owned by institutional investors, and academic literature has used institutional ownership as a proxy for supply in the equity loan market.²⁰⁴ Consequently, if institutional holdings are relatively low, the supply of shares available to be borrowed could be limited, which could increase borrowing costs. A paper by Professor Nagel states that “short-sale constraints...should mainly affect stocks with low

²⁰⁰ Feinstein Deposition, 135:10–135:19 (“Q. Are there other examples of impediments that would restrict short selling in a way that’s inconsistent with an efficient market? A. Well, yes. I -- I just -- I described one. If there’s just no shares to borrow, in order to short sell, you have to find someone’s shares who’s willing to lend them to you, and sometimes it’s hard to find those or impossible to find those ... shares to borrow.”).

²⁰¹ Feinstein Deposition, 134:5–134:14 (“When -- when there’s -- when there’s a lot of short selling, a tremendous amount of short selling, sometimes it gets hard to borrow the stock for short selling purposes. And sometimes people will say that -- it doesn’t mean it’s impossible to borrow. It just means it’s harder to borrow or maybe a little more costly to borrow, and then someone will say, ‘Well, that’s an impediment to short selling, so that’s got to make the market inefficient.’ But that argument doesn’t hold up”).

²⁰² Feinstein Deposition, 135:19–135:24 (“A -- shares to borrow. I -- what I looked at -- when I looked at the short selling data, I saw there was plenty of short selling, which indicated it wasn’t impossible to borrow -- it wasn’t impossible to borrow and short sell the stock since there was so much of the short selling happening.”).

²⁰³ Saffi and Sigurdsson (2011), pp. 821–852.

²⁰⁴ D. Hirshleifer, S. H. Teoh, and J. J. Yu (2011), “Short Arbitrage, Return Asymmetry, and the Accrual Anomaly,” *The Review of Financial Studies* 24(7), pp. 2429–2461 at pp. 2431, 2434 (“We consider institutional ownership as an instrument for the amount of loanable shares to proxy for the ease of short arbitrage. ... Several authors document that institutional owners provide the main loan supply of stock, and consequently, the level of institutional ownership is a key proxy for ease of short selling (Asquith, Pathak, and Ritter 2005; Nagel 2005).”).

institutional ownership”²⁰⁵ and Professors Asquith, Pathak, and Ritter state that “the stocks that are most likely to be short sale constrained” are those “that have large short positions combined with low institutional ownership.”²⁰⁶ Dr. Feinstein fails to consider that Cassava’s stock could have such characteristics.

105. As shown in **Exhibit 6**, this description applies to Cassava. The percentage of Cassava’s shares that were held by institutional investors (based on quarterly SEC filings) was consistently below 30% during the Proposed Class Period.²⁰⁷ Cassava’s level of institutional ownership would rank in the bottom quartile based on data collected in a recent study conducted by Professors Lewellen and Lewellen, which found the 25th percentile of firms had institutional ownership of 30%.²⁰⁸ Critically, this low percentage of Cassava’s shares held by institutions was roughly equal to the number of shares already sold short for a majority of the Proposed Class Period (with average short interest of 28% and average institutional holdings of 26% in 2022). This suggests there were constraints in the number of Cassava shares available for borrowing by a short seller.

106. Consistent with this, the available data suggest that the utilization rate of Cassava’s shares available for lending—a measure of the quantity of the available inventory of a stock that has been lent out—reached over 93% in December 2021 (around the same time that Cassava’s short interest peaked) and stayed above that level for the remainder of the Proposed Class Period, with a high above 99% (see **Exhibit 7**).²⁰⁹ For comparison, the 99th percentile in the sample from the study by Professor Muravyev had a utilization rate of 86%, while the median was only 12%.²¹⁰

²⁰⁵ S. Nagel (2005) “Short sales, institutional investors and the cross-section of stock returns,” *Journal of Financial Economics* 78(2), pp. 277–309.

²⁰⁶ P. Asquith, P. A. Pathak, and J. R. Ritter (2005), “Short interest, institutional ownership, and stock returns,” *Journal of Financial Economics* 78(2), pp. 243–276, p. 307. The authors “define short sale constrained stocks as those in the highest [i.e., the 99th] percentile of short interest ratios that are also ranked in the lowest third of stocks [within that top percentile] by institutional ownership.” When compared to the data from Muravyev et al. (2022), Cassava is between the 90th and 99th percentiles of short interest ratios. When compared to the data from Lewellen and Lewellen (2022), Cassava is below the 25th percentile of institutional ownership. See J. Lewellen and K. Lewellen (2022), “Institutional Investors and Corporate Governance: The Incentive to Be Engaged,” *The Journal of Finance* 77(1), pp. 213–264 (“Lewellen and Lewellen (2022)”) at p. 223.

²⁰⁷ Institutional holdings data comes from SEC Form 13-F filings available through *Refinitiv*. Dr. Feinstein also relies on data from 13-F filings in his report. See Feinstein Report, ¶ 89 (“*Refinitiv Eikon* compiles and provides institutional ownership data drawn from SEC Form 13-F filings.”).

²⁰⁸ The study by Professors Lewellen and Lewellen also uses data from 13-F filings. The 25th percentile of institutional ownership of 30% was calculated during the time period from 2015 to 2017, the most recent reported in their study. See Lewellen and Lewellen (2022), pp. 220, 223 (“Our main data come from Thomson Reuters’ database of 13F filings with the SEC.”).

²⁰⁹ See Muravyev et al. (2022), p. 1800 (“the utilization rate (Utilization), defined as the ratio of the quantity on loan to the lendable quantity[.]”).

²¹⁰ Muravyev et al. 2022, p. 1802. Another paper from Schultz (2024) found that the 95th percentile utilization rate was 70.443% while the median was 8.079% in his sample of companies from July 2006 to December 2019. See

107. Further, consistent with a limited supply of shares available to borrow, the borrowing costs for Cassava's stock were high during portions of the Proposed Class Period. **Exhibit 8** shows the cost of borrowing faced by short sellers of Cassava's stock. The average cost of borrowing during the Proposed Class Period of 15% was approximately equal to the 99th percentile cost of borrowing of 15% in the study by Professor Muravyev.²¹¹ Further, the rate reached as high as 67% in June 2022, with other spikes above 40% in February 2022 and 45% in September 2022.²¹² As discussed above, such high borrowing costs can make it difficult for short sellers to profit from their strategy, thereby impeding the ability of investors to short stocks. For example, an annual fee of 70% indicates that a short seller would pay 70% of the price of the stock over the course of a year to maintain an open short position.

108. Thus, Dr. Feinstein fails to assess constraints in the number of Cassava shares available for borrowing by a short seller. Likewise, Dr. Feinstein has conducted no analysis on the costs of short selling for Cassava's stock, which were especially high in 2022, or addressed the potential implications of such costs on market efficiency. Given the data from the stock lending market that provides evidence of potential frictions that could impact the ability of arbitrageurs to sell short Cassava's stock, Dr. Feinstein's analysis is deficient, flawed, and unreliable.

2. Dr. Feinstein Fails to Analyze the Implications of Reduced Analyst Coverage During the Proposed Class Period

109. For his analysis of *Cammer* Factor 2, Dr. Feinstein states that "securities analysts facilitate the flow of information and the digestion of information within the marketplace"

P. Schultz (2024), "Short Squeezes and Their Consequences," *Journal of Financial and Quantitative Analysis*, 59(1), pp. 68–96 ("Schultz (2024)"), Table 1.

²¹¹ Muravyev et al. (2022), p. 1802. As another point of comparison, Schultz (2024) find that the 95th percentile borrowing cost was 14% on a subset of his sample covering 2013 to 2019. See Schultz (2024), p. 75. The variable used by Muravyev et al. (2022) comes from Markit and is defined as "[t]he expected borrow cost, in fee terms, for a hedge fund on a given day. This is a derived rate using Data Explorers proprietary analytics and data set. The calculation uses both borrow costs between Agent Lenders and Prime Brokers as well as rates from hedge funds to produce an indication of the current market rate. It should not be assumed that the indicative rate is the actual rate a Prime Broker will quote or charge but rather an indication of the standard market cost." Consistent with this finding, Engelberg et al. (2018) finds that the 99th percentile cost of borrowing was 14.79% across a sample of 4,500 U.S. stocks from July 2006 to December 2011. Both studies used data from Markit, although the specific variables used differed between the two, as the Engelberg et al. (2018) measure is computed from lender-side fees while the Muravyev et al. (2022) measure is computed from buy-side indicative fees. See Muravyev et al. (2022), p. 1800; Engelberg et al. (2018), pp. 762–763.

²¹² The "Offer Rate" variable from S3 Partners reflects the weighted-average borrowing rate paid by short sellers for all existing short positions, reflecting the cost of borrowing. See "S3 Short Interest and Data Field Definitions," *S3 Partners*.

and that “[t]he presence of analysts ... promote efficiency.”²¹³ He finds that Cassava was covered by six equity analysts during the Proposed Class Period,²¹⁴ and that five of those analysts “contributed to the consensus estimates for Cassava during the Class Period.”²¹⁵ He concludes that “the coverage of Cassava by professional securities analysts is compelling evidence that the market for Cassava stock was an efficient market throughout the Class Period.”²¹⁶

110. However, Dr. Feinstein’s analysis of this factor is, again, flawed and deficient. Specifically, his analysis fails to address the reduction in analyst coverage over time and the challenges certain analysts noted in assessing the Company’s stock when suspending their coverage of Cassava’s stock. Indeed, during some periods of the Proposed Class Period, the existing few analysts had substantially different views.

111. First, while there may have been as many as six analysts covering the stock at certain times, that was not the case throughout the Proposed Class Period. As shown in **Exhibit 9**, the number of analysts contributing a price target to the consensus estimates as reported by *I/B/E/S* was five (the number cited by Dr. Feinstein) for only a few months during the Proposed Class Period. For most of the Proposed Class Period, there were no more than four analysts contributing a price target. At times there were fewer and by the end of the Proposed Class Period only two analysts continued to contribute price targets (see **Exhibit 9**). Therefore, given the variation in analyst coverage over time, it is not clear how Dr. Feinstein can use the maximum number of analysts covering the stock during the Proposed Class Period as “compelling evidence that the market for Cassava’s stock was an efficient market *throughout* the Class Period.”²¹⁷

112. Critically, Dr. Feinstein fails to analyze the content of the analyst reports, including recognizing the explanation given by several analysts for *why* they stopped covering Cassava. On August 27, 2021 Cantor Fitzgerald suspended its provision of a rating and price target as uncertainty following the Citizen Petition made it challenging to “effectively diligence” the

²¹³ Feinstein Report, ¶ 82.

²¹⁴ Feinstein Report, ¶¶ 84–86.

²¹⁵ Feinstein Report, ¶ 85.

²¹⁶ Feinstein Report, ¶ 87.

²¹⁷ Feinstein Report, ¶ 87 (emphasis added). Though Dr. Feinstein stated in his deposition that he knew “exactly what the analyst coverage [was] over the entire class period” he only referenced the total number of analysts that published reports or contributed to the consensus estimates during the Proposed Class Period in his report discussion. See Feinstein Deposition, 23:6–23:9. See *also* Feinstein Report, ¶¶ 84–85.

stock.²¹⁸ Additionally, Maxim Group cited uncertainty when suspending its coverage of Cassava less than a year later, on April 26, 2022, stating:

There is continued uncertainty related to the simufilam data with five retracted papers in March 2022 by PLoS ONE (author Hoau-Yan Wang, a professor at the City University of New York, Cassava collaborator). In addition, there is uncertainty related to the ongoing SEC investigation. Combined with the impact of the Citizen's Petitions which were initially filed in August 2021 (since denied, as announced by Cassava in February 2022), short reports and other factors, the net result seems to have materially impacted the ability of the ongoing phase 3 program in Alzheimer's disease to enroll patients, with only ~60 patients of the needed 1,750 enrolled as per a company update in March 2022. The company has ~\$230M in cash as of 12/31/21, which should be sufficient runway through 2024, possibly longer depending on the costs of the P3 studies as they move forward. That said, our concern is if the trial can enroll efficiently, and right now it is not clear. Therefore, we are temporarily suspending coverage of SAVA.²¹⁹

113. Dr. Feinstein states that analysts "help market participants acquire relevant information and understand the implications of that information for valuation and investment decisions."²²⁰ However, Dr. Feinstein fails to address the implications of low analyst coverage for periods of the Proposed Class Period, particularly in light of the reasons analysts articulated for dropping coverage. Moreover, when the Company only had three analysts covering the stock starting in January 2023, the remaining analysts had largely different views. While B. Riley had a price target of only \$28, H.C. Wainwright and Jones Trading had price targets of \$100 or more.²²¹ To the extent uncertainty about the company was such that information could, in fact, not be effectively assessed by even "professional securities

²¹⁸ "Simufilam Diligence Challenge Tough to Reconcile; Suspending Rating and PT," *Cantor Fitzgerald*, August 27, 2021, FEINSTEIN_0001911, p. 1. Cantor Fitzgerald subsequently published a report on October 6, 2021, but did not provide a rating or price target. See "P3 RETHINK-ALZ Enrollment Study Start Calendarizes Time to Data for Symptomatic Benefit Trial," *Cantor Fitzgerald*, October 6, 2021, FEINSTEIN_0001890, p. 2 ("We previously used a DCF analysis to value SAVA. At this time, many of our assumptions about simufilam in Alzheimer's disease are awaiting clarifying information and data. As a result, we are suspending our price target.").

²¹⁹ "Suspension of Coverage Report," *Maxim Group*, April 26, 2022, FEINSTEIN_0001466, p. 1. Although patient enrollment for the Phase 3 trials was completed after the end of the Proposed Class Period, Maxim Group has not reinstated coverage of Cassava, based on the database of analyst reports available to me through *Capital IQ* and *Refinitiv Eikon*. See "Cassava Sciences Completes Enrollment for Pivotal Phase 3 Program of Simufilam in Alzheimer's Disease" *Cassava Sciences*, November 6, 2023.

²²⁰ Feinstein Report, ¶ 82.

²²¹ *Refinitiv*.

analysts,” Dr. Feinstein fails to explain how it would have been efficiently incorporated in the stock price.

VII. Dr. Feinstein Fails to Reliably Establish That Each Cassava Option Series Traded in an Efficient Market during the Proposed Class Period

114. In this section, I explain that Dr. Feinstein fails to reliably establish that the Cassava options traded in efficient markets during the Proposed Class Period. **Section VII.A** provides an overview of options markets and discusses market efficiency in the context of equity options.

115. **Section VII.B** summarizes Dr. Feinstein’s analysis of the efficiency of the markets for the Cassava options. As described in that section, Dr. Feinstein provides two general types of support for his opinion that Cassava options traded in efficient markets. First, Dr. Feinstein seeks to conceptually link the efficiency of option markets to the efficiency of the market for the underlying stock.²²² He states that “[a]ccording to generally accepted principles of financial valuation ..., a stock option’s price is a function of the underlying stock price. Therefore, if the underlying stock is efficient ... so too is the option efficient, as it too will reflect the same public information.”²²³ Second, Dr. Feinstein conducts two pieces of analysis based on a “synthetic stock price” he derives from a theoretical relationship between option and stock prices: a “collective event study” similar to the analysis conducted for Cassava’s stock,²²⁴ and an analysis of the correlation between Cassava’s stock price and the “synthetic” stock prices implied by the Cassava options.

116. In **Section VII.C**, I demonstrate that Dr. Feinstein’s indirect evidence of efficiency for the Cassava options markets (*i.e.*, linking efficiency of the Cassava options to Cassava’s stock or options markets in general) is unreliable. As I discuss in **Section VII.D**, Dr. Feinstein fails to demonstrate a cause-and-effect relationship between new, value-relevant information and individual option prices, which he describes as an “empirical demonstration of market efficiency.”²²⁵ First, in his analysis of *Cammer* Factor 5, Dr. Feinstein relies on

²²² Feinstein Report, ¶ 216 (“Thus, the *Cammer* and *Krogman* factors that indicated that the market for Cassava stock was an efficient market also serve to indicate that the market for Cassava stock options was an efficient market.”) (emphasis in original).

²²³ Feinstein Report, ¶ 188.

²²⁴ Feinstein Report, ¶ 195–197. Dr. Feinstein further asserts that due to “time decay and the impact of the other relevant variables, the price dynamics of an option price continuously change.” He admits that “[t]hese changing price dynamics make it impossible to conduct an event study on the returns of an individual options contract.” See Feinstein Report, ¶ 195.

²²⁵ Feinstein Report, Section VIII.

quotes, which represent the bids or the offers posted by market participants at prices they are willing to trade, rather than actual trade prices, to derive his synthetic stock price.²²⁶ Relying on quotes obscures the fact that many options traded infrequently, including on days with large price movements or news identified by Dr. Feinstein. Second, the synthetic stock price he calculates for his analysis is derived using a formula that applies to European options, although Cassava's options contracts are American.^{227,228} Third, his analysis ignores the wide heterogeneity between individual option series by using a single average.²²⁹

117. Additionally, as discussed in **Section VII.E**, Dr. Feinstein does not conduct any analysis of the other *Cammer* and *Krogman* factors for the options in his report, despite emphasizing the importance of these factors in assessing market efficiency in this matter and having previously analyzed these factors for options in other reports.²³⁰ Dr. Feinstein fails to explain why the other factors he relies on to assess the efficiency of the market for Cassava's stock (and described as "probative indicators of market efficiency")²³¹ are not relevant for the Cassava options.²³² Indeed, Dr. Feinstein has stated that the "factors that indicate the efficiency of the market for ... common stock ... are relevant to assessing the efficiency of the market for ... options."²³³ When I analyze some of these factors, however, I find evidence for many of the Cassava options of illiquidity in the form of low trading volume and high transaction costs (high bid-ask spreads), which were likely impediments to the ability of

²²⁶ Feinstein Report, ¶ 200; "IvyDB File and Data Reference Manual," *OptionMetrics* ("Best Bid: The best, or highest bid price across all exchanges on which the option trades. ... From July 30, 2009 onward, 15:59 ET quotes are used.").

²²⁷ Feinstein Report, ¶¶ 198–199; J. Hull (2015), *Options, Futures, and Other Derivatives*, 9th ed. Upper Saddle River, NJ: Pearson ("Hull (2015)"), pp. 241–245. Dr. Feinstein's data indicates the exercise style of all options in his analysis is "A," which indicates that the options are American. See FEINSTEIN_0006835.XLSX.

²²⁸ Because American options can be exercised at any time prior to expiration, there is premium that is normally paid for them relative to European options, which can only be exercised at expiration. This premium due to the additional exercise right makes the option value calculation using the pricing formula proposed by Dr. Feinstein flawed. See Y. Kwok (2008), *Mathematical Models of Financial Derivatives*, 2nd ed., Berlin, Heidelberg: Springer, p. 251 ("The distinctive feature of an American option is its early exercise privilege, that is, the holder can exercise the option prior to the date of expiration. Since the additional right should not be worthless, we expect an American option to be worth more than its European counterpart. The extra premium is called the early exercise premium." (emphasis removed)). Although Dr. Feinstein's formula can be applied to American *call* options for stocks like Cassava that do not pay a dividend, the right to exercise early is valuable for put options even for stocks that do not pay a dividend.

²²⁹ Dr. Feinstein used the closing bid [and ask] quotes of every listed Cassava option contract during the class period, computed the synthetic bid [and ask] stock price, and averaged all prices to arrive at that day's synthetic stock bid [and ask] price. See Feinstein Report, ¶ 200.

²³⁰ Expert Report of Dr. Steven P. Feinstein, Ph.D. on Market Efficiency, *In re Apple Securities Litigation*, May 5, 2021.

²³¹ Feinstein Report, ¶ 18.

²³² Feinstein Report, ¶ 189. See also, Feinstein Report, ¶ 186 ("In sum, Cassava stock satisfied the *Cammer* and *Krogman* factors over the course of the entire Class Period, usually by wide margins. Given these facts, I conclude that the market for Cassava stock was an efficient market throughout the entire Class Period").

²³³ Expert Report of Dr. Steven P. Feinstein, Ph.D. on Market Efficiency, *In re Apple Securities Litigation*, May 5, 2021, ¶ 146.

arbitrageurs to correct mispricing and impound value-relevant information into the option prices quickly.

118. Finally, I discuss the heterogeneity of trading across Cassava options in **Section VII.F** and explain why this heterogeneity renders Dr. Feinstein's analysis on a single metric unreliable. Specifically, Dr. Feinstein concludes that "Cassava options traded in an efficient market over the course of the Proposed Class Period"²³⁴ based on his analysis of a *portfolio* of options without evaluating any of the more than 15,000 single options individually. This aggregate approach ignores differences in the trading of the over 15,000 individual options, including that some options consistently have much higher transaction costs compared to others and are traded sparsely. Indeed, by comparing only the *average* synthetic stock price with Cassava's common stock price, Dr. Feinstein obscures the fact that some of his synthetic stock prices deviate from the common stock price substantially (in some instances by more than 30%).²³⁵

A. Background on Options and Efficiency of Options Markets

119. An equity option gives the buyer the right to either buy (in the case of call options) or sell (in the case of put options) a particular stock at a pre-specified price (the "strike price") before or at a particular point in time (the "maturity" or "expiration" date).²³⁶ A unique combination of option type (call or put), strike price, and maturity date defines an "option series."²³⁷ According to the best known and most widely adopted pricing model for equity options, the Black-Scholes model,²³⁸ the value of an option depends on six factors: current price of the underlying stock, strike price of the option, time to maturity, volatility of the

²³⁴ Feinstein Report, ¶ 218.

²³⁵ Cassava options cannot be considered homogenous for the purpose of testing market efficiency. Even if the prices of some option series rapidly and fully incorporated new information, the prices of other option series may have reacted differently or not reacted at all. Given that it is possible for the prices of some option series to react quickly and fully to news on a particular day and for the prices of other option series not to do so, it is not appropriate to pool and analyze Cassava options only in aggregate. Indeed, as explained in Section VII.F below, some Cassava options traded frequently whereas other options traded only rarely, if at all. See **Exhibit 13**.

²³⁶ Hull (2015), p. 213. One equity option contract gives the holder of the call (put) option the right to buy (sell) 100 shares of the underlying stock. See *also*, "Equity Options Product Specifications," CBOE, available at https://www.cboe.com/exchange_traded_stock/equity_options_spec/ ("Underlying: Generally, 100 shares of the underlying equity security").

²³⁷ Hull (2015), p. 220.

²³⁸ Myron Scholes and Robert Merton were awarded the 1997 Nobel Memorial Prize in Economic Sciences for their work related to the model (Fischer Black died in 1995 and was therefore ineligible). See R. C. Merton (1973), "Theory of Rational Option Pricing," *Bell Journal of Economics and Management Science* 4(1), pp. 141–183; F. Black and M. Scholes (1973), "The Pricing of Options and Corporate Liabilities," *Journal of Political Economy* 81(3), pp. 637–654; "Press Release," *The Royal Swedish Academy of Sciences*, October 14, 1997.

underlying stock price, risk-free rate, and expected dividends.²³⁹ Changes in any of these factors affect the value of the option.²⁴⁰

120. If the underlying stock price is such that exercising the option would be profitable (*i.e.*, above the strike price for a call and below the strike price for a put), the option is described as “in the money;” if the underlying stock price is such that exercising the option would *not* be profitable (*i.e.*, below the strike price for a call and above the strike price for a put), the option is described as “out of the money.”²⁴¹ Thus, how the current stock price compares relative to the strike price is known as “moneyness.”²⁴²

121. The two most common types of option contracts are “American” and “European” option contracts. The difference between the two is that American options can be exercised at any time before the maturity date, while European options can only be exercised on the maturity date.²⁴³ In certain cases, it might be optimal to exercise an option before the maturity date, in which case the American option provides valuable flexibility.²⁴⁴ The Cassava options at issue were American options.²⁴⁵

122. In frictionless markets, the “law of one price” dictates that any two securities, or portfolios of securities, with the same payoff have the same price. Because one can replicate the payoffs of a stock by buying and selling European options and either borrowing or investing money, a relationship known as “put-call parity” defines the theoretical relationship between the price of a European put option, the price of a European call option with the same strike and expiry date, and the underlying stock.²⁴⁶ As discussed below, Dr. Feinstein uses

²³⁹ Hull (2015), p. 250. (“There are six factors affecting the value of a stock option: the current stock price, the strike price, the expiration date, the stock price volatility, the risk-free interest rate, and the dividends expected during the life of the option.”).

²⁴⁰ Hull (2015), p. 235.

²⁴¹ Hull (2015), p. 220.

²⁴² Hull (2015), p. 440.

²⁴³ Hull (2015), p. 213.

²⁴⁴ Brealey et al. (2011), p. 543 (“For example, suppose that immediately after you buy an American put, the stock price falls to zero. In this case there is no advantage to holding onto the option since it cannot become more valuable. It is better to exercise the put and invest the exercise money. Thus an American put is always more valuable than a European put.” (emphasis removed)).

²⁴⁵ Dr. Feinstein’s data indicates the exercise style of all options in his analysis is “A,” which indicates that the options are American. See FEINSTEIN_0006835.XLSX.

²⁴⁶ Specifically, an investor can replicate owning a share of stock by buying a (European) call option, selling a corresponding put, and investing at the risk-free interest rate. An investor can replicate shorting a share of stock by selling a (European) call option, buying a corresponding put, and borrowing the present value of the strike price and expected dividends at the risk-free rate. See Hull (2015), p. 242 (“This relationship is known as put–call parity. It shows that the value of a European call with a certain exercise price and exercise date can be deduced from the value of a European put with the same exercise price and exercise date, and vice versa.”). See *also*, Ross et al. (2010), p. 684 (“This relationship now states that you can replicate the purchase of a share of stock by buying a call, selling a put, and buying a zero-coupon bond.”).

this relationship to construct a synthetic price of Cassava's stock from individual option prices.²⁴⁷

123. Each individual option series included in Dr. Feinstein's analysis represents a unique financial instrument that was independently listed and traded on the Chicago Board Options Exchange ("CBOE").²⁴⁸ This means that any trade, or quote published by a market maker, is specific to a particular option series, and there is no single security that could be purchased by an investor to incorporate the economic characteristics and payoffs of *all* different "Cassava Options." Although in efficient markets the values of the various options are influenced by certain common factors (*i.e.*, underlying stock price, stock price expected volatility), values of different option series have different sensitivities to the underlying stock's price and volatility fluctuations depending on, among other things, their expiration date and moneyness.²⁴⁹ This means that two buyers of similar Cassava call options, one that is at the money and another that is deeply out of the money, can experience different economic outcomes for the same underlying stock price movement, even if the prices of those securities fully incorporate information relevant to their values.

B. Summary of Dr. Feinstein's Options Efficiency Analysis

124. Dr. Feinstein mainly uses two general approaches to support his opinion that "the Cassava options traded in an efficient market over the course of the Class Period."²⁵⁰

125. First, Dr. Feinstein attempts to support his conclusion by linking the market efficiency of the Cassava options to that of the underlying stock and to the efficiency of options markets in general. He asserts that "if the underlying stock is efficient and reflects public information, so too is the option efficient, as it too will reflect the same public information."²⁵¹ Furthermore, Dr. Feinstein claims that the fact that Cassava options traded on the CBOE serves as "strong evidence that the Cassava options traded in an efficient market throughout the Class Period."²⁵² Dr. Feinstein also asserts that for some companies,

²⁴⁷ Feinstein Report, ¶ 200.

²⁴⁸ Each option series in the data Dr. Feinstein produced has a distinct value for the "Symbol." For example, the Symbol "SAVA 210618C45000" identifies a call option series with an expiration date of June 18, 2021 and a strike price of \$45.00. See FEINSTEIN_0002497.

²⁴⁹ Hull (2015), p. 440.

²⁵⁰ Feinstein Report, ¶ 218.

²⁵¹ Feinstein Report, ¶ 188.

²⁵² Feinstein Report, ¶ 191.

academic evidence suggests that options may incorporate the impact of new, company-specific information even more quickly than common stock.²⁵³

126. Second, Dr. Feinstein “conducted collective event studies on ... synthetic Cassava stock prices using the same “collective event study” methodology that [he] used for the Cassava stock.”²⁵⁴ For this analysis, Dr. Feinstein creates a synthetic stock price using the put-call parity relationship (described earlier) from each specific option series averaged into a single synthetic price.²⁵⁵ Dr. Feinstein asserts that a “synthetic” stock bid or ask price can be constructed using the put-call parity relationship. For example, an investor can create a synthetic long exposure to Cassava’s stock by buying a call option at its ask price, selling a corresponding put at its bid price, and investing at the risk-free interest rate to execute this transaction.²⁵⁶ He uses such a relationship to construct a time series of synthetic stock bid and ask prices for every option pair during the Proposed Class Period.²⁵⁷ He then averages all the synthetic bid and ask prices during each day to obtain a single daily bid price and ask price. Finally, he takes the midpoint of the bid and ask for each day and uses this as a single Cassava “synthetic price.”²⁵⁸ Thus, via the many steps described above, he attempts to aggregate the price information across all of the options into a single average synthetic stock price.

127. He uses the same three alternative classifications of news events (8-K events, 8-K events excluding earnings announcements, and top news article days) as for his common stock event studies and compares the frequency of statistically significant movements of the synthetic stock prices on each set of these days against that on all other days during the Proposed Class Period.²⁵⁹ Similar to Cassava’s stock, he finds a statistically significant difference in the frequency of significant synthetic returns between news event dates and “non- or lesser-news days”.²⁶⁰

²⁵³ Feinstein Report, ¶ 192 (“The academic literature attests that options quickly respond to new, company-specific information, and further, that for some companies, options may incorporate the impact of new, company-specific information even quicker than common stock.”).

²⁵⁴ Feinstein Report, ¶ 197.

²⁵⁵ Feinstein Report, ¶ 200.

²⁵⁶ The call and put options must have the same strike price and time to maturity. See Feinstein Report, ¶ 198. He further asserts that the reverse relationship is true, where an investor would sell a call at its bid price, buy a corresponding put at its ask price, and borrow the present value of the strike and anticipated dividends in order to synthetically short Cassava’s stock (at the “synthetic bid” price). See Feinstein Report, ¶ 199.

²⁵⁷ An option pair is represented by an individual call and an individual put option with the same strike price and time to maturity. See Hull (2015), pp. 241–242.

²⁵⁸ Feinstein Report, ¶ 200.

²⁵⁹ Feinstein Report, ¶ 197.

²⁶⁰ Feinstein Report, ¶¶ 206, 209, 212.

128. Finally, Dr. Feinstein also computes the correlation between the synthetic Cassava stock returns and the actual Cassava stock returns. He reports that a “high correlation is compelling evidence that the Cassava options appropriately tracked the Cassava common stock” and, observing such a correlation, infers efficiency for the Cassava options.²⁶¹

C. Dr. Feinstein’s Reliance on the Purported Efficiency of the Market for Cassava’s Stock or for Options Generally Is Insufficient to Infer Efficiency for Cassava Options

129. As described above, Dr. Feinstein attempts to link the efficiency of the Cassava options markets to the efficiency of the underlying stock price.²⁶² He asserts that “if the underlying stock is efficient and reflects public information, so too is the option efficient, as it too will reflect the same public information.”²⁶³ To begin, Dr. Feinstein’s claim is premised on his conclusion that the market for Cassava’s stock is efficient, and is therefore unreliable for the reasons described in **Section VI** above.

130. Moreover, even if the market for Cassava’s stock were efficient, there is no reliable basis to presume efficiency for the market of each Cassava option. For example, it is possible for the market for a stock to be efficient while the options on that stock are highly illiquid and as a result potentially trade in inefficient markets. As summarized above, the academic literature has demonstrated that market efficiency must be empirically tested for individual securities during specific periods of time.

131. Finally, Dr. Feinstein’s claims (1) that the fact that Cassava options traded on the CBOE serves as “strong evidence that the Cassava options traded in an efficient market throughout the Class Period”²⁶⁴ and (2) that, for “some companies, options may incorporate the impact of new, company-specific information even more quickly than common stock,” are similarly unsupported.²⁶⁵

132. The market efficiency of securities listed on the CBOE generally, or of some other companies’ options, has little bearing on the efficiency of the markets for Cassava options. Moreover, contrary to Dr. Feinstein’s claims that “the generally accepted wisdom among

²⁶¹ Feinstein Report, ¶ 215.

²⁶² Feinstein Report, ¶ 188.

²⁶³ Feinstein Report, ¶ 188.

²⁶⁴ Feinstein Report, ¶ 191.

²⁶⁵ Feinstein Report, ¶ 192 (“The academic literature attests that options quickly respond to new, company-specific information, and further, that for some companies, options may incorporate the impact of new, company-specific information even quicker than common stock.”).

financial economists is” that the options market is efficient, a number of academic studies suggest the options markets can be inefficient.²⁶⁶

133. For example, an academic study by Professors Santa-Clara and Saretto notes that “limits to arbitrage, represented by transaction costs and margin requirements” are present in the options markets.²⁶⁷ Similarly, another study by Professors Lin and Lu finds that “the price efficiency of puts” is hindered by high short selling costs on the underlying stock (as was the case for Cassava, as discussed in **Section VI.C.1** above).²⁶⁸ Furthermore, a study by Professors Ackert and Tian finds that “S&P 500 index options are frequently mispriced to a significant extent,” and that there are “significant violations of pricing relations across option and stock markets” that may “indicate market inefficiency.”²⁶⁹ As noted by Professors Basak and Croitoru, “[s]uch mispricings clearly lead to opportunities for arbitrage profits.”²⁷⁰

D. Dr. Feinstein’s Analysis of *Cammer* Factor 5 for the Cassava Options Fails to Demonstrate a Cause-and-Effect Relationship between New, Value-Relevant Information and Individual Option Prices

134. In terms of his “collective test,” as for Cassava’s stock, Dr. Feinstein fails to consider whether Cassava options’ prices demonstrate “non-reaction to non-information,”²⁷¹ or alternatively whether they appear to react to stale or no information, which would raise questions about the efficiency of the market, as discussed above. Applying the same analysis as for Cassava’s stock discussed in **Section VI.B.2**, I show that there is a concentration of statistically significant changes in the *synthetic* price on dates with high social-media activity but deemed as “non- or lesser-news days” by Dr. Feinstein.²⁷² Applying the same test used by Dr. Feinstein, I find that these High Social Media Days are associated with a higher

²⁶⁶ Feinstein Deposition, 226:5–226:8.

²⁶⁷ P. Santa-Clara and A. Saretto (2009), “Option strategies: Good deals and margin calls,” *Journal of Financial Markets* 12(3), pp. 391–417 at p. 414. See also L. Deville and F. Riva (2007), “Liquidity and arbitrage in options markets: A survival analysis approach,” *Review of Finance* 11(3), pp. 497–525.

²⁶⁸ T. Lin and X. Lu (2016), “How do short-sale costs affect put options trading? Evidence from separating hedging and speculative shorting demands,” *Review of Finance* 20(5), pp. 1911–1943.

²⁶⁹ L. F. Ackert and Y. S. Tian (2001), “Efficiency in index options markets and trading in stock baskets,” *Journal of Banking & Finance* 25(9), pp. 1607–1634 at pp. 1609, 1627.

²⁷⁰ S. Basak and B. Croitoru (2006), “On the Role of Arbitrageurs in Rational Markets,” *Journal of Financial Economics* 81(1), pp. 143–173, p. 144 (“Recent examples include the deviations from put-call parity in options markets (Ofek et al., 2004) and the paradoxical behavior of prices in some equity carve-outs (Lamont and Thaler, 2003). ... Such mispricings clearly lead to opportunities for arbitrage profits, and not surprisingly, there is ample evidence of market participants engaging in trades designed to reap these profits.”).

²⁷¹ Shleifer (2000), p. 5.

²⁷² As discussed in **Section VI.A**, Dr. Feinstein presents three different event study models, which produce three different sets of residual returns and t-statistics (to determine statistical significance) for each day during the Proposed Class Period. My use of Dr. Feinstein’s event study model is for illustrative purposes only and should not be considered an endorsement of his methodology or his results.

proportion of statistically significant changes in the *synthetic* price constructed from options than the remaining “non- or lesser-news days,” as shown in **Exhibit 10A**.²⁷³ As with the common stock, the frequency of these significant returns is statistically indistinguishable from the frequency of any of Dr. Feinstein’s three sets of “news days,” as shown in **Exhibit 10B**. Dr. Feinstein’s failure to analyze the relationship between social media activity and the statistically significant changes of his synthetic stock price on these “non- or lesser-news days” renders his “cause-and-effect” and market efficiency conclusions with respect to the options unreliable.

135. Moreover, to construct a synthetic stock price, Dr. Feinstein relies not on actual transaction prices, but on end-of-day bid and ask *quotes*.²⁷⁴ He has ignored that quoted prices can become stale or may, for various reasons, not reflect actual trading prices. This is also an issue because, by using quotes, Dr. Feinstein is able to include options that had no trading at all, even though he testified in his deposition that such options do not “provide evidence one way or the other for the options that do trade.”²⁷⁵

136. Thus, instead of testing directly whether *actual* option prices moved in response to news, Dr. Feinstein tests whether *average synthetic* stock prices, implied by his theoretical model and based on market *quotations* that may have differed from actual trade prices, moved in response to news.²⁷⁶ With his approach, he pays no attention to the fact that options did not necessarily trade on days with large stock price movements or with news.

²⁷³ In addition to the ten High Social Media Days associated with statistically significant returns in at least one of Dr. Feinstein’s event study models for Cassava’s stock discussed in **Section VI.B**, one additional High Social Media Day is associated with a statistically significant return in Dr. Feinstein’s Top Article Count event study model for the synthetic stock—February 10, 2022. See Feinstein Report, Exhibit 29. On that date, the FDA published a response to the Citizens Petition. See “FDA DENIES CITIZEN PETITION ON CASSAVA DRUG \$SAVA,” *Twitter*, February 10, 2022 10:58 AM ET, available at <https://x.com/zbiotech/status/1491803806140612608>. Also on that date, Cassava issued a press release after market hours that Plaintiffs allege “disingenuously suggested that Cassava had been cleared of wrongdoing by the FDA.” See Supplemented Consolidated Complaint, ¶ 412. See also “Press Release: FDA Denies Citizen Petitions Filed on Behalf of Short Selling Clients,” *Dow Jones Institutional News*, February 10, 2022 4:07 PM ET, FEINSTEIN_0005421.

²⁷⁴ Feinstein Report, ¶ 200.

²⁷⁵ See Feinstein Deposition, 236:3–236:19 (“So I think the conclusion is self-evident if it doesn’t trade at all, and it’s not part of the case anyway because no one’s buying it. Q. ... Does that mean, then, that -- that such a situation, if there’s an option that does not trade during the class period, that that cannot provide evidence that the market for Cassava options is efficient during the class period? ... THE WITNESS: If it -- if an option is not trading at all, then it’s not providing evidence about whether the options that do trade are trading in an efficient market. It -- it’s essentially non-existent. It doesn’t -- it doesn’t provide evidence one way or the other for the options that do trade.”).

²⁷⁶ Feinstein Report, ¶ 194, 200. Furthermore, as previously discussed, the calculation of the synthetic stock price is performed using data on *quoted* bid and ask prices. This is a different approach than what Dr. Feinstein uses to analyze the efficiency of Cassava’s stock for his *Cammer* Factor 5, where he uses end of day *traded* prices instead of *quoted* prices. Due to the thinly traded nature of certain option series, which underlines the fact that there are important potential constraints to arbitrage in the options market, Dr. Feinstein’s aggregated approach to analyzing the efficiency of thousands of options is unreliable. Moreover, the put-call parity formula does not necessarily always hold, simply due to high costs or risks faced by arbitrageurs when correcting

137. To illustrate the lack of trading of options, for each day with a statistically significant residual return based on Dr. Feinstein’s “collective event study” for 8-K Events, I calculate the number of options available for trading, and the number of those options that actually traded.²⁷⁷ This is presented in **Exhibit 11A**. For example, on July 27, 2022, there were 334 call options and 334 put options available for trading. Out of these, despite the statistically significant negative stock price movement and synthetic stock price movement, 27% of call options and 48% of put options had *no* trading volume during that day.²⁷⁸ On the 36 statistically significant days according to Dr. Feinstein’s 8-K event study, an average of 27% of call options and 48% of put options did not trade.

138. I also calculated these statistics for days with 8-K news identified by Dr. Feinstein, and present the results in **Exhibit 11B**. For example, on May 2, 2023—a “news day” according to two of Dr. Feinstein’s three definitions—out of 294 call options and 294 put options available for trading, 72% of call options and 78% of put options had *no* trading volume. Across all of Dr. Feinstein’s 8-K “news days,” on average 49% of call options and 67% of put options did not trade.

139. As described in **Section VII.E** below, many of the options traded infrequently, even on his so-called “news days.” Because information gets impounded in prices through trading, this pattern raises additional concerns about his use of a “collective test” based on option quotes as a basis for concluding that the options traded in efficient markets. Indeed, absent any trading by nearly half of call options and more than half of put options that he uses to analyze his “news days,” Dr. Feinstein’s conclusion that these news events were efficiently incorporated into option prices is unsupported.²⁷⁹

140. Additionally, the formula Dr. Feinstein uses to calculate synthetic stock prices applies for European options and not for American options, like the Cassava options.²⁸⁰ For American options, which unlike European options can be exercised before their maturity, the

“mispricing.” There may be situations in which security prices fail to incorporate information, but there is no consistent arbitrage opportunity due to high transaction costs, for example in the form of high bid-ask spreads (as exhibited by Cassava options). See Shleifer and Vishny (1997).

²⁷⁷ Statistical significance is evaluated at the 95% confidence level.

²⁷⁸ As further discussed in **Section VII.E**, Dr. Feinstein does not address the fact that call [put] options, on average, *did not trade* on 57% [64%] of the available trading days in the Proposed Class Period. Dr. Feinstein claims that “[o]ptions are designed to move with the underlying stock,” however, a significant portion of options in his sample trade infrequently. See **Exhibit 13**, Feinstein Report, ¶ 216.

²⁷⁹ As discussed above, Dr. Feinstein’s analysis relies on quotes, not actual trades, and thus obscures this issue.

²⁸⁰ See Brealey et al. (2011), p. 510 (“Put–call parity holds only if you are committed to holding the options until the final exercise date. It therefore does not hold for American options, which you can exercise *before* the final date.”) (emphasis in original).

put-call relationship implies a range of valid prices for the call and put options.²⁸¹ This range provides an upper and lower bound on a combination of call and put prices such that there are no arbitrage opportunities from buying and selling the call, put, and underlying stock. Thus, the individual synthetic prices calculated by Dr. Feinstein are not truly a synthetic stock price, since all Cassava options are *American*, while the method he uses only provides a synthetic price based on *European* options.²⁸²

141. Finally, Dr. Feinstein’s average synthetic stock price is derived based on an average from *all* call and put quotes for individual option series during each day. As described above, he combines quotes across all options into an average synthetic bid and synthetic ask price and takes the midpoint of the two to calculate a single synthetic stock price for each day.²⁸³ Dr. Feinstein then concludes that because the synthetic price derived from this *combination* of quotes for calls and puts reacts more frequently on “news days” relative to other days, all *individual* options comprising the average combination trade in efficient markets. By design, however, his test cannot discern if the market for a particular option was inefficient even if it *failed to react to any* value-relevant information, as such evidence could have easily been masked by his focus solely on the average synthetic stock price based on option quotes. Therefore, his analysis cannot reliably demonstrate that each *individual* option traded in an efficient market during the Proposed Class Period.

E. Dr. Feinstein Fails to Consider the Other *Cammer* and *Krogman* Factors for the Cassava Options, which Provide Evidence Inconsistent with Market Efficiency for Many of the Cassava Option Series

142. In his analysis of Cassava’s stock, Dr. Feinstein considers eight factors that he describes as “generally accepted and widely used indicia of market efficiency” and “probative indicators of market efficiency.”²⁸⁴ Although Dr. Feinstein states that the factors are “individual pieces of evidence that are each probative of the degree to which the market for a security is expected to be efficient,” in his analysis of the Cassava options markets, Dr. Feinstein only analyzes one factor, the *Cammer* Factor 5.²⁸⁵

²⁸¹ Hull (2015), p. 251 (“Put–call parity does not hold for American options. However, it is possible to use arbitrage arguments to obtain upper and lower bounds for the difference between the price of an American call and the price of an American put.”).

²⁸² Feinstein Report, ¶ 198. See *also*, Brealey et al. (2011), p. 543 (“Because the Black–Scholes formula does not allow for early exercise, it cannot be used to value an American put exactly.”).

²⁸³ Feinstein Report, ¶ 200.

²⁸⁴ Feinstein Report, ¶ 18.

²⁸⁵ Feinstein Report, ¶ 70.

143. Two of the factors that Dr. Feinstein ignores, bid-ask spreads (*Krogman* Factor 3)²⁸⁶ and trading volume (*Cammer* Factor 1), assess market liquidity. Despite using evidence of liquidity to support his conclusion of stock market efficiency, Dr. Feinstein's analysis ignores the evidence of *illiquidity* that may impede market efficiency for some of the options.²⁸⁷

144. First, Dr. Feinstein states that a "narrow bid-ask spread makes trading in the security less costly for investors and ... promote[s] market efficiency."²⁸⁸ Conversely, therefore, the high bid-ask spreads found in the markets for Cassava options make trading in the securities more costly for investors and may impede market efficiency. High bid-ask spreads make it challenging for investors to take advantage of arbitrage opportunities from incorrect option prices since high transaction costs reduce—and may even eliminate—the profitability of arbitrage.²⁸⁹ If so, investors may be unable to trade in a manner such that information can be fully and quickly incorporated in the price.

145. In his analysis of Cassava's stock, Dr. Feinstein claims that the "narrow bid-ask spread in the market for the Cassava stock supports a conclusion of market efficiency."²⁹⁰ However, he does not conduct the same analysis on the markets for the Cassava options. During the Proposed Class Period, the average bid-ask spread for Cassava call [put] options is 48% [42%].²⁹¹ By comparison, Professors Cao and Han report in an academic study that the average bid-ask spread for options is 21%.²⁹² The 90th percentile of Cassava call [put] options is 112% [116%], compared to 42% in the data used by the Cao and Han study.

²⁸⁶ Dr. Feinstein stated in his deposition that he "used the bid-ask spreads in the construction of the synthetic stocks." However, using closing bid and ask prices to calculate a mid price as Dr. Feinstein did in his report, does not mean that he "took ... into account" the size of the bid-ask spread, as the mid-price he calculated would be the same regardless of the size of the spread between the bid and the ask prices. Dr. Feinstein agreed that beyond using bid and ask prices in his "construction of the synthetic stocks" he did not analyze the bid-ask spread for the Cassava options. See Feinstein Deposition, 233:12–233:25.

²⁸⁷ In his deposition, Dr. Feinstein stated that it was not necessary to evaluate *Cammer* and *Krogman* factors such as trading volume and bid-ask spreads for the Cassava options because they were "proved to be empirically be moving with the stock." If Dr. Feinstein is suggesting that a high correlation between his synthetic stock price and the actual stock price is sufficient to prove efficiency for each option regardless of whether the other *Cammer* and *Krogman* factors are satisfied, he is incorrect because, as explained in **Section VII.D** above, his analysis cannot demonstrate that each *individual* option traded in an efficient market during the Proposed Class Period because it only looks at an average derived from all 15,000 options (including many that never trade). See Feinstein Deposition, 231:25–232:5.

²⁸⁸ Feinstein Report, ¶ 75.

²⁸⁹ Brealey et al. (2011), p. 327 ("In an efficient market, if prices get out of line, then arbitrage forces them back. The arbitrageur buys the underpriced securities (pushing up their prices) and sells the overpriced securities (pushing down their prices). The arbitrageur earns a profit by buying low and selling high and waiting for prices to converge to fundamentals. Thus arbitrage trading is often called convergence trading. In practice arbitrage is harder than it looks. Trading costs can be significant and some trades are difficult to execute.").

²⁹⁰ Feinstein Report, ¶ 119.

²⁹¹ See **Exhibit 12**.

²⁹² J. Cao and B. Han (2013), "Cross Section of Option Returns and Idiosyncratic Stock Volatility," *Journal of Financial Economics* 108(1), pp. 231–249, Table 1.

146. **Exhibit 12** shows that 50% of call [put] options have average bid-ask spreads exceeding 32% [22%], while at least 25% of call [put] options during the Proposed Class Period have average bid-ask spreads exceeding 70% [57%].²⁹³ Average spreads on individual Cassava options reached as high as 199% [198%].²⁹⁴ To put these bid-ask spreads in context, a bid-ask spread of 100% would mean that investors would need to pay *three times as much* to buy an option as they would receive from selling that option—for instance, on a day when investors could buy an option for \$3, they could sell it for only \$1.²⁹⁵ The 25% of call [put] option series with the lowest spreads had average spreads of 17% [11%], still substantially higher than the spreads of Cassava’s stock, but also substantially lower than those of less liquid Cassava options.

147. Even for Cassava options that are in the money and should therefore exhibit price dynamics closely reflecting Cassava’s stock price in efficient markets, bid-ask spreads were large. As shown in **Exhibit 12**, Dr. Feinstein’s data indicate that bid-ask spreads averaged 21% [18%] across call [put] options that were in the money and 65% [63%] across call [put] options that were out of the money.²⁹⁶ Thus, the bid-ask spreads for out of the money call options were over *three times as large* as the bid-ask spreads for in the money call options. Furthermore, the largest 10% of bid-ask spreads on in the money call options exceeded 37%, while the largest 10% of spreads on out of the money call options exceeded 127%. Thus, the average spread for these “most expensive” (in terms of relative trading cost) call options were more than *three times as large* for out of the money than for in the money options.

148. The relatively wide bid-ask spreads overall, and the heterogeneity of bid-ask spreads across option series, shows the deficiency and unreliability of Dr. Feinstein’s cursory analysis of market efficiency for all Cassava options.

149. Second, Dr. Feinstein does not assess the liquidity or market depth of Cassava options, either in aggregate or for individual option series. As shown in **Exhibit 13**, on average, options did not trade on *more than half* of the available trading days. Specifically,

²⁹³ See **Exhibit 12**.

²⁹⁴ The bid-ask spread is calculated as the difference between the best bid and ask quotes, divided by the midpoint of the two.

²⁹⁵ Academic literature provides other points of comparison. For example, Ramachandran & Tayal (2021) find average [median] option bid-ask spreads of 17% [14%] for calls and 15% [12%] for puts in a sample of options trading between 2006 and 2007. See L. S. Ramachandran and J. Tayal (2021), “Mispricing, Short-sale Constraints, and the Cross-section of Option Returns,” *Journal of Financial Economics* 141(1), pp. 297–321 at p. 303. As another example, Chaudry (2015) finds an average bid-ask spread ranging between 4%–19% for calls and 4%–16% for puts depending on their moneyness, using daily option data between 1996 and 2010. See M. Chaudry (2015), “Option Bid-Ask Spread and Liquidity,” *Journal of Trading* 1(3), pp. 44–56 at p. 53.

²⁹⁶ See **Exhibit 12**.

call [put] options, on average, *did not trade* on 57% [64%] of the available trading days in the Proposed Class Period.²⁹⁷ Furthermore, 25% of call [put] options had *no trading* on 90% [96%] of the days during the Proposed Class Period (and a full 10% of both call and put options had no trading at all). Many options in Dr. Feinstein's sample thus exhibit illiquidity and sparse trading. Because Dr. Feinstein uses option quotes, which were provided in the data even when an option did not trade, his analysis masks such evidence of illiquidity.

150. The low trading volume observed for individual Cassava options suggests that it may be difficult for investors to take advantage of option prices that do not reflect publicly available information. This, as a result, could impede trading by arbitrageurs seeking to correct mispricing and thus impede the efficiency of the Cassava options markets, which Dr. Feinstein fails to analyze.

F. Dr. Feinstein's Options Analysis Fails to Account for the Heterogeneity across the Cassava Options and the Markets Where the Options Traded

151. Dr. Feinstein concludes that "Cassava options traded in an efficient market over the course of the Class Period," based on his analysis of a *portfolio* of options and without evaluating any of the individual option contracts individually.²⁹⁸ Given that each individual option contract for Cassava is a unique and separate financial instrument, each quote published by a market maker represents the price for a single security. Thus, there is no single security that can be traded which incorporates the economic characteristics and payoffs of *all* Cassava options.

152. In fact, as presented in **Exhibit 14**, Dr. Feinstein aggregates 15,016 individual option contracts, with 212 unique strike prices ranging from \$0.50 to \$210, 137 unique maturity dates ranging from September 18, 2020 to January 16, 2026, and 7,508 pairs of call and put options, with unique strike price-maturity combinations.²⁹⁹

153. Despite these differences, Dr. Feinstein treats all Cassava options as if they form a single security trading in a single market. This approach completely ignores the fundamental heterogeneity in terms of option types (difference between call versus put options), strike

²⁹⁷ My analysis is limited to the periods in which an option was available to trade. That is, if an option expired on the 100th day of the Proposed Class Period, I only consider the first 100 days and not the remainder of the Proposed Class Period.

²⁹⁸ Feinstein Report, ¶ 218.

²⁹⁹ The options Dr. Feinstein considers in his analysis have times to maturity ranging between 0 days to 858 days. Dr. Feinstein pools together *quotes* of options trading on the same day as their maturity date and *quotes* of options expiring 858 days (2.3 years) into the future.

prices, and maturities of different options, which can lead to different risks and payouts across the whole range of options. These different risks and payouts may coincide with different trading behaviors and different market characteristics.

154. For example, suppose the current stock price of Cassava is \$10, and consider a call option with a strike price of \$100 and a maturity of one week. The call option would allow an investor to bet that the price will increase 900% within one week, which is typically unlikely. Thus, because the likelihood of this call option to become in the money is relatively low, the price of this call option today will also be low. On the other extreme, suppose again that the current stock price of Cassava is \$10, but the investor purchases a call option with a strike price of \$11 and a maturity of one year. Because the stock price is relatively close to the strike price and the maturity is long, it is more likely that the call option will become in the money and will be exercised (*e.g.*, if the stock price becomes \$12 within the year, it will be profitable to exercise the option with the strike price of \$11). Thus, the price today will also be high. The investors trading these different types of options may have different risk profiles, look for different economic payoffs, and/or follow different trading strategies. The prices for these two different call options will be set in two different markets.³⁰⁰ Indeed, as discussed in **Section VII.E** above, the markets for different Cassava options were characterized by different trading frequencies and bid-ask spreads.

155. Dr. Feinstein's synthetic stock averages a wide range of individual synthetic stock prices derived from options as disparate as those above. **Exhibit 15** presents the disaggregation of Dr. Feinstein's *average* synthetic stock price into *individual* synthetic stock prices. The difference between the actual stock price and individual synthetic stock prices that enter his analysis exceeds 18% (or \$4) for at least one option pair every day between May 1, 2022 and June 30, 2023.³⁰¹ Dr. Feinstein ignores this wide range of individual synthetic stock prices, which suggests that his methodology does not accurately represent individual option prices.

156. As a further illustration, consider five option pairs presented in **Exhibit 16**, with strike prices ranging from \$35 to \$145 and expiration dates between February 17, 2023 and January

³⁰⁰ An option with a strike price that is close to the current price of the underlying stock (in the money or close to the money) may trade in a market with market depth and liquidity that are very different from an option that is deeply out of the money (*i.e.*, where the strike price is far away from the current price of the underlying stock). See C. Etling and T.W. Miller, Jr. (2000), "The Relationship Between Index Option Moneyness and Relative Liquidity," *The Journal of Futures Markets* 20(10), pp. 971–987 at p. 986.

³⁰¹ See **Exhibit 15**.

17, 2025.³⁰² In **Exhibit 16**, I plot the percentage by which the synthetic stock price derived from each option pair deviated from the actual Cassava stock price. This exhibit shows that using Dr. Feinstein’s methodology, the synthetic stock price for the five option pairs is consistently lower than the actual stock price throughout the life of the option.

157. For example, the green dots, representing options with a strike price of \$35 and a maximum time to maturity of approximately nine months, show that these options initially deviated from the stock price by approximately 10–15%, but that deviation narrowed as the options approached maturity. The options expiring in 2024 (represented by the blue dots and red triangles) began trading in late 2021 with relatively modest deviations, but those deviations widened through the first nine months of 2022, as the options moved farther out of the money, before generally narrowing again.³⁰³ Interestingly, the purple squares, representing options with a strike price of \$40, experienced deviations of more than 20% in late 2022, even though they were in or near the money at that time.³⁰⁴

158. These deviations show that *all* of Dr. Feinstein’s empirical analyses for the Cassava options—his three “collective tests” and his computation of the correlation between the synthetic stock returns and the actual stock returns—are flawed and deficient because each such analysis is based on a single synthetic stock price that obscures the heterogeneity of the underlying options. As Dr. Feinstein’s analyses mask and ignore the important heterogeneity across option securities, his analyses and conclusion are unreliable.

VIII. The Majority of Alleged Corrective Disclosure Dates Are Not Associated with Statistically Significant Residual Price Declines Using Dr. Feinstein’s Models

159. As I discuss more fully in the next section, Dr. Feinstein provides a high-level generic description of his proposed damages approach. Within this discussion, Dr. Feinstein suggests that he would estimate inflation by “working chronologically backwards from the final corrective disclosure back to the start of the Class Period” starting from the residual price declines on alleged corrective disclosure dates.³⁰⁵ However, as discussed below, the majority of dates on which I understand that Plaintiffs allege corrective information came to the

³⁰² See **Exhibit 16**.

³⁰³ See **Exhibit 2 and Exhibit 16**.

³⁰⁴ See **Exhibit 2 and Exhibit 16**.

³⁰⁵ Feinstein Report, ¶ 230 (“Construction of the inflation ribbon generally employs event study analysis, combined with widely used and generally accepted valuation tools. The inflation ribbon is often constructed by working chronologically backwards from the final corrective disclosure back to the start of the Class Period, accounting for alleged fraud-related residual price declines as they occurred.”).

market are not associated with statistically significant price declines in any of Dr. Feinstein's three event study models.³⁰⁶ On such dates, there is no scientific basis to conclude that the price movements were not caused by random variation in the stock price.

160. In Dr. Feinstein's discussion of market efficiency, he explains that, in an efficient market, disclosures of new, value-relevant information are expected to be associated with statistically significant price changes.³⁰⁷ If the market for Cassava's stock was efficient, as Dr. Feinstein claims, he fails to explain how alleged corrective disclosures that are not associated with statistically significant price changes can be used to estimate removal of inflation attributed to alleged misrepresentations.³⁰⁸

161. As discussed in **Section III**, my understanding based on a review of the Supplemented Consolidated Complaint is that Plaintiffs allege that corrective information about the alleged misrepresentations was disclosed on 17 dates.³⁰⁹ Further, as noted in **Section III**, for four of these disclosures (*i.e.*, the Citizen Petition on August 24, 2021; the *Journal of Neuroscience* Expression of Concern on December 17, 2021; the *New York Times* article on April 18, 2022; and the *Science* article on October 12, 2023), Plaintiffs allege that Cassava's stock price continued to decline on a second trading day after the disclosure of the allegedly corrective news.

162. **Exhibit 17** shows the residual returns in each of Dr. Feinstein's three event studies for the 21 days (17 plus 4) discussed in the Supplemented Consolidated Complaint as being associated with alleged corrective disclosures. As shown in the exhibit, on the majority of days on which I understand Plaintiffs allege corrective information came to the market or the

³⁰⁶ As noted in previous sections, my use of the results from Dr. Feinstein's models in this report is for illustrative purposes only and should not be considered an endorsement of his methodology or his results.

³⁰⁷ Feinstein Report, ¶ 127 ("If a stock's event date residual return is statistically significant, it indicates that the stock price movement cannot be attributed to market factors, sector factors, or to random volatility, but rather was caused by new, company-specific information.").

³⁰⁸ Dr. Feinstein simply notes that, as a first step to his damages analysis, "valuation tools, which would include event study analysis, and potentially other empirical analyses, if necessary, would be used to establish if corrective disclosures caused the price of the Cassava Securities to fall." See Feinstein Report, ¶ 230. Dr. Feinstein notes that he has "not conducted a loss causation analysis or computed damages as of this time." See Feinstein Report, ¶ 221. However, my understanding is that while plaintiffs' experts are not asked to implement a damages methodology at the class certification stage of a securities class action litigation, they are required to articulate *how* they would estimate damages at a later stage of the case.

³⁰⁹ As noted in **Section III**, these are dates on which Plaintiffs discuss allegedly corrective information that was disclosed in Section I as well as Sections VII–IX of the Supplemented Consolidated Complaint. Plaintiffs discuss six of these dates in the section of the Supplemented Consolidated Complaint (Section XII) discussing loss causation and economic loss. Plaintiffs discuss only three alleged corrective disclosure dates in their motion for class certification. Dr. Feinstein discusses nine dates on which the alleged "truth about the Company's research, analysis, and clinical trials" was disclosed. To the extent that Plaintiffs clarify that any of the 17 dates discussed in this section are not alleged corrective disclosure dates, I reserve the right to amend my analysis accordingly. See Supplemented Consolidated Complaint, ¶¶ 495–Supp. 5; Plaintiffs' Opposed Motion for Class Certification, *In re Cassava Sciences, Inc. Securities Litigation*, District Court for the Western District of Texas, Austin Division, Master File No. 1:21-cv-00751-DAE, March 13, 2024, pp. 4–5; Feinstein Report, ¶¶ 47–55.

market continued to react to allegedly corrective information, Cassava's stock price is not associated with a statistically significant residual stock price decline in any of Dr. Feinstein's event study models.³¹⁰

163. First, only six of the nine alleged corrective disclosures discussed in the Feinstein Report are associated with statistically significant price declines in Dr. Feinstein's three event study models, while the other three alleged corrective disclosures are not. Dr. Feinstein does not comment on whether his damages methodology would estimate inflation using the price declines on all of the corrective disclosure dates Plaintiffs allege in the Supplemented Consolidated Complaint. Instead, he states that the alleged "truth about the Company's research, analysis, and clinical trials" emerged over nine disclosure events.³¹¹

164. As shown in **Exhibit 17**, three of the nine dates he discusses are not associated with statistically significant price declines in any of the three event study models that he presents in his report. Specifically:

- a. Dr. Feinstein states that on August 30, 2021 a "supplement to the Citizen Petition identified additional examples of apparent scientific misconduct by Cassava and Dr. Wang."³¹² This date is not associated with a statistically significant price decline in any of Dr. Feinstein's event study models.³¹³ I have identified no confounding news between market close on Friday August 27, 2021 and market close on August 30, 2021 that would have obscured an otherwise negative, statistically significant stock price reaction.³¹⁴⁻³¹⁵

³¹⁰ As shown in **Exhibit 17**, the results from Dr. Feinstein's event study models discussed in this section are consistent across all three of his event study models (e.g., days that are statistically insignificant are statistically insignificant across all three of his event study models).

³¹¹ Feinstein Report, ¶ 47. When asked in his deposition whether he knew which dates are pled as alleged corrective disclosure dates in this case, Dr. Feinstein stated that "they're in the complaint" but "I may not agree with all of them when I do the damages analysis. I may find that there are more or less." See Feinstein Deposition, 244:4–244:9.

³¹² Feinstein Report, ¶ 50.

³¹³ See **Exhibit 17**.

³¹⁴ In reviewing company-specific news here and below, I examined all analyst reports published between one day prior through a week after each alleged corrective disclosure. I also examined all Factiva searches provided by Dr. Feinstein published on the day of each alleged corrective disclosure and the prior trading day. I have also reviewed a set of the most influential posts on Reddit (including on WallStreetBets) and Twitter to supplement these sources. Given the large volume of social media posts on some dates, I focused my review on the 100 Reddit posts and 100 tweets on each date with the highest "Reddit Score" and "Impressions," respectively, which are available through the Brandwatch database.

³¹⁵ I identified no analyst reports published on August 30, 2021. A *Seeking Alpha* article discussing Cassava's price decline on August 30, 2021 noted that Cantor Fitzgerald had suspended their coverage of the Company, citing a "diligence challenge." See "Cassava Shares Continue Slide, Down Another 7%; Cantor Suspends Coverage (updated)," *Seeking Alpha*, August 30, 2021. See also "Simufilam Diligence Challenge Tough to Reconcile; Suspending Rating and PT," *Cantor Fitzgerald*, August 27, 2021, FEINSTEIN_0001911.

- b. Dr. Feinstein states that on September 3, 2021 “the Company admitted that some contents of the Citizen Petition and its supplement were true.”³¹⁶ This date is not associated with a statistically significant price decline in any of Dr. Feinstein’s event study models.³¹⁷ The disclosure by Cassava acknowledging certain data errors was made in a Company press release that, according to Plaintiffs, also simultaneously “denied the accusations in the Citizen Petition” and “continued to ... defend” Dr. Wang.³¹⁸ Dr. Feinstein does not explain how he could estimate the impact of allegedly corrective information given this combination of information and the fact that this alleged corrective disclosure date is not associated with a statistically significant price decline. Beyond the press release at issue, I have identified no confounding news between market close on September 2, 2021 and market close on September 3, 2021, that would have obscured an otherwise negative, statistically significant stock price reaction.³¹⁹
- c. Dr. Feinstein states that on November 15, 2021 Cassava disclosed in its SEC Form 10-Q filing that certain regulatory agencies had asked the Company for information.³²⁰ This date is not associated with a statistically significant price decline in any of Dr. Feinstein’s event study models.³²¹ I have identified no discussion by analysts of any confounding disclosure in the Form 10-Q and no otherwise confounding news between market close on Friday November 12,

³¹⁶ Feinstein Report, ¶ 50.

³¹⁷ See Exhibit 17.

³¹⁸ Supplemented Consolidated Complaint, ¶¶ 331–333.

³¹⁹ Plaintiffs also note other negative information about Cassava that came to market later on the same date, namely Dr. Bik’s comments on Twitter that “[l]eaving out a value that does not fit with the hypothesis cannot be brushed off as just ‘removing an outlier’ that was left in by error. This is a *very serious and intentional action* that needs much more explanation.” See Supplemented Consolidated Complaint, ¶ 336 (emphasis in original). Based on a review of analyst reports, public press, and social media about Cassava, I did not identify any other new company-specific information that came to market on this date.

³²⁰ Feinstein Report, ¶ 51.

³²¹ See Exhibit 17.

2021 and market close on November 15, 2021 that would have obscured an otherwise negative, statistically significant stock price reaction.^{322,323}

165. Second, as shown in **Exhibit 17**, of the eight alleged corrective disclosure dates that are discussed in the Supplemented Consolidated Complaint but not in Dr. Feinstein's report, *none* are associated with statistically significant price declines. Specifically:

- a. On November 10, 2021, after "'original' data was made publicly available by the *Journal of Neuroscience*, Dr. Bik reviewed the materials and raised numerous concerns on Twitter and PubPeer."³²⁴ Also on November 10, 2021, Cassava reported its financial results for the third quarter of 2021, announcing a net loss of \$0.24 per share.³²⁵ This date is not associated with a statistically significant price decline in any of Dr. Feinstein's event study models.³²⁶
- b. On December 9, 2021 a "fourth supplement to the Citizen Petition was publicly filed by the FDA" concerning alleged data manipulation and fabrication in a 2017 *Neurobiology of Aging* paper.³²⁷ This date is not associated with a statistically significant price decline in any of Dr. Feinstein's event study models.³²⁸ I have identified no confounding news between market close on December 8, 2021 and market close on December 9, 2021 that would

³²² Earnings information published in the Company's SEC Form 10-Q on November 15, 2021 had previously been disclosed. See, e.g., "Connecting the Dots on One Roller Coaster of a Year for SAVA Shares," *Maxim Group*, November 11, 2021, FEINSTEIN_0001870. A Seeking Alpha article noted the Company's disclosure regarding government investigations. See "Cassava Sciences Cites Government Probe in Latest Regulatory Filing," *Seeking Alpha*, November 15, 2021. I have identified no analyst reports published on November 15, 2021 or in subsequent days. Note that analysts have incentives to comment on new and value-relevant information. As a result, published commentary can help assess what information analysts viewed as important. For example, one academic paper notes, "analysts have incentives to compete for trading volume.... Thus when analysts receive public disclosures from the firm, they have incentives to process the information and issue revisions as soon as possible." See J. Livnat and Y. Zhang (2012), "Information Interpretation or Information Discovery: Which Role of Analysts Do Investors Value More?" *Review of Accounting Studies* 17(3), pp. 612–641 at p. 616. See also A. H. Huang et al. (2018), "Analyst Information Discovery and Interpretation Roles," *Management Science* 64(6), pp. 2833–2855 at p. 2834 ("[B]y interpreting only the relevant topics in corporate disclosures, analysts attract and direct investors' limited attention to what they view as being important.").

³²³ Plaintiffs also allege that the SEC Form 10-Q "misleadingly failed to disclose ... that multiple government agencies, including the DOJ, SEC and NIH, had opened investigations into Cassava and that the DOJ probe, in particular, was a criminal investigation." See Supplemented Consolidated Complaint, ¶ 365 (emphasis omitted). However, in an efficient market, the omission of information would not be expected to cause a positive stock price reaction that could have obscured a negative one.

³²⁴ Supplemented Consolidated Complaint, ¶ 24.

³²⁵ "Cassava Sciences Reports Third Quarter 2021 Financial Results," *GlobeNewswire*, November 10, 2021 9:00 AM ET, FEINSTEIN_0005227. Two analysts that covered Cassava issued reports on November 11, 2021. Both had little discussion on the financial results but noted the higher than expected expenses incurred by Cassava. See "Connecting the Dots on One Roller Coaster of a Year for SAVA Shares," *Maxim Group*, November 11, 2021, FEINSTEIN_0001870; "Don't Look Now but the First Simufilam Phase 3 Was Initiated; Reiterate Buy Rating and \$124 PT," *H.C. Wainwright*, November 11, 2021, FEINSTEIN_0001879.

³²⁶ See **Exhibit 17**.

³²⁷ Supplemented Consolidated Complaint, ¶ 31.

³²⁸ See **Exhibit 17**.

have obscured an otherwise negative, statistically significant stock price reaction.³²⁹

- c. On December 17, 2021 the “*Journal of Neuroscience* changed its ‘Editorial Note’ ... into an Expression of Concern.”³³⁰ This date is not associated with a statistically significant price decline in any of Dr. Feinstein’s event study models.³³¹ I have identified no confounding news between market close on December 16, 2021 and market close on December 17, 2021 that would have obscured an otherwise negative, statistically significant stock price reaction.³³²
- d. On December 20, 2021, after market hours, Dr. Bik “found extensive evidence of manipulations in the so-called original data” after the “journal *Neuroscience* said it found ‘no evidence’ of manipulation.”³³³ December 21, 2021 is not associated with a statistically significant price decline in any of Dr. Feinstein’s event study models.³³⁴ On the morning of December 21, 2021, Cassava issued a press release regarding the journal’s findings, which, according to Plaintiffs, contained false and misleading statements.³³⁵ Dr. Feinstein does not explain how he could estimate the impact of allegedly corrective information given this combination of information and the fact that this alleged corrective disclosure date is not associated with a statistically significant price decline.
- e. On January 3, 2022 the journal *Molecular Neurodegeneration* retracted a 2021 paper by agreement of its authors due to irregularities found in published data

³²⁹ I identified no analyst reports or public press articles published during this time. I did not identify any new, value-relevant information discussed in social media commentary that has not been identified in Dr. Feinstein’s sources.

³³⁰ Supplemented Consolidated Complaint, ¶¶ 33–34.

³³¹ See Exhibit 17.

³³² I identified no analyst reports published during this time. The only public press article identified in Dr. Feinstein’s Factiva results reports on the “expression of concern.” See “15:39 EST Journal of Neuroscience publishes expression of concern on Cassava...” Theflyonthewall.com, December 17, 2021, 3:39 PM ET, FEINSTEIN_0005349. I do not identify any new, value-relevant information discussed in social media commentary that has not been identified in Dr. Feinstein’s sources.

³³³ Supplemented Consolidated Complaint, ¶ 36. Plaintiffs do not allege in the Supplemented Consolidated Complaint a day on which Cassava’s stock price fell on this news. The first tweets from Dr. Bik I identify occur after market hours on December 20, 2021. See “Neuroscience just posted an Editorial Note about a paper by HY Wang at all related to Cassava Sciences \$SAVA The authors provided original, uncropped blots. But as with the J Neuroscience correction, I am not sure if these are indeed original. <https://sciencedirect.com/science/article/pii/S0306452221005789>,” *Twitter*, December 20, 2021 7:08 PM ET, available at <https://x.com/MicrobiomDigest/status/1473083028029140993>.

³³⁴ See Exhibit 17.

³³⁵ “Science Journal Finds No Evidence to Support Claims of Data Manipulation in 2005 Publication,” *GlobeNewswire*, December 21, 2021 9:30 AM ET, FEINSTEIN_0005353.

originating from Dr. Wang's lab."³³⁶ There was some social media discussion on this day about a purportedly "forged DOJ letter claiming an investigation against short sellers."³³⁷ This date is not associated with a statistically significant price decline in any of Dr. Feinstein's event study models.³³⁸

- f. On March 22, 2022 the journal "*Neurobiology of Aging* issued an Expression of Concern regarding a 2017 paper by Drs. Burns and Wang."³³⁹ This date is not associated with a statistically significant price decline in any of Dr. Feinstein's event study models.³⁴⁰ I have identified no confounding news between market close on March 21, 2022 and market close on March 22, 2022 that would have obscured an otherwise negative, statistically significant stock price reaction.³⁴¹
- g. On March 30, 2022 the journal "*PLOS One retracted five papers* authored by Drs. Wang and Burns."³⁴² This date is not associated with a statistically

³³⁶ Supplemented Consolidated Complaint, ¶ 37. Plaintiffs do not allege in the Supplemented Consolidated Complaint a day on which Cassava's stock price fell on this news. Additionally, I have identified no analyst reports or public press articles published between market close on January 3, 2022 and market close on January 4, 2022. Some social media posts after market hours on January 4, 2022 referenced an investor presentation from Cassava. However, I do not identify any references to this presentation during market hours on January 4, 2022. There are no public press articles in Dr. Feinstein's Factiva results until January 6, 2022 and no analyst reports published in the following week mention this presentation. See, e.g., "\$SAVA | Cassava Corporate presentation - January 2022," *Twitter*, January 4, 2022 5:00 PM ET, available at <https://x.com/CassavaSciences/status/1478486583670104073?lang=en>.

³³⁷ I have identified no analyst reports or public press articles published during this time. Some social media posts on this date discussed an image of a "DOJ #FOIA response regarding Cassava Sciences." Some users identified it as "patently forged." See, e.g., "Beware: Desperate \$SAVA bulls are circulating a patently forged DOJ letter claiming an investigation against short sellers. Numerous mistakes starting from my last name and United Dept. of Justice instead of United States. This is a textbook case of market manipulation," *Twitter*, January 3, 2022, available at <http://twitter.com/QCMFunds/statuses/1478036830251585536>; "There's an image circulating today of a DOJ #FOIA response regarding Cassava Sciences. Someone wants us to believe it's real. We don't think it is. | It's electronic trail should be relatively easy for investigators to follow. Criminal charges could easily result. \$SAVA," *Twitter*, January 3, 2022, available at <http://twitter.com/probesreporter/statuses/1478065550890835968>.

³³⁸ See Exhibit 17.

³³⁹ Supplemented Consolidated Complaint, ¶ 38. Plaintiffs do not allege in the Supplemented Consolidated Complaint a day on which Cassava's stock price fell on this news. The first reference I identify to this information on social media occurs during market hours on March 22, 2022. See "<https://sciencedirect.com/science/article/pii/S0197458022000562> | New Corrigendum Issued! Journal cops out and issues E.O.C. pending CUNY Coming Soon we hope, we all need a definitive voice. \$SAVA @AD3ENDALZ @ADScience4 @lawrenceshaw82 @MicrobiomDigest @JJSchaible @IBD_AGatlin," *Twitter*, March 22, 2022 3:16 PM ET, available at <https://x.com/sing3r/status/1506349082448519169>.

³⁴⁰ See Exhibit 17.

³⁴¹ I identified no analyst reports or public press articles published during this time. I did not identify any new, value-relevant information discussed in social media commentary that has not been identified in Dr. Feinstein's sources.

³⁴² Supplemented Consolidated Complaint, ¶ 39. Plaintiffs do not allege in the Supplemented Consolidated Complaint a day on which Cassava's stock price fell on this news. The first reference I identify to this information on social media occurs during market hours on March 30, 2022. See "There are actually FIVE @PLOS ONE retractions of papers from Dr. HY Wang today \$SAVA https://journals.plos.org/plosone/search?filterJournals=PLoSONE&q=retraction&sortOrder=DATE_NEWEST_FIRST&page=1," *Twitter*, March 30, 2022 3:15 PM ET, available at https://x.com/Adrian_H/status/15092480898594306.

significant price decline in any of Dr. Feinstein's event study models.³⁴³ I have identified no confounding news between market close on March 29, 2022 and market close on March 30, 2022 that would have obscured an otherwise negative, statistically significant stock price reaction.³⁴⁴

- h. On June 1, 2022 the journal "*Alzheimer's Research & Therapy* retracted a 2017 paper published by Dr. Wang" noting that "[f]ollowing publication, concerns have been raised regarding the western blot images presented in Figs. 1, 5 and 6."³⁴⁵ This date is not associated with a statistically significant price decline in any of Dr. Feinstein's event study models.³⁴⁶ I have identified no confounding news between market close on May 31, 2022 and market close on June 1, 2022 that would have obscured an otherwise negative, statistically significant stock price reaction.³⁴⁷

166. Third, of the four dates that Plaintiffs discuss as having reflected "continued" market reaction on a second trading day,³⁴⁸ only one is associated with a statistically significant price decline for Cassava's stock in Dr. Feinstein's three event study models, as shown in **Exhibit 17**. Moreover, while Dr. Feinstein does not specify in his report whether he would use the price declines on these dates to estimate inflation, a price reaction over multiple days without further information release would not be consistent with Dr. Feinstein's assertion of market

³⁴³ See **Exhibit 17**.

³⁴⁴ I identified no analyst reports published during this time. An article published on March 29, 2022 reports on a Form 4 filing. After market hours on March 29, 2022, a Form 4 was filed reporting that Robert Gussin exercised options and held the obtained shares (after covering the strike price for the exercise). See "Cassava Sciences Inc. – Statement of Changes in Beneficial Ownership (Form 4)," SAEXC, March 29, 2022. See Cassava Sciences, Inc., Form 4, filed March 29, 2022. At 9:05 AM ET on March 30, 2022, Cassava issued a press release announcing a fireside chat and presentation with "CEO Remi Barbier to Discuss Q1 2022 Clinical and Corporate Updates." The press release did not provide any additional information on what information would be shared during this presentation. See "Cassava Sciences Announces Fireside Chat and Presentation Tuesday, April 5th," *Cassava Sciences*, March 30, 2022, available at <https://www.cassavasciences.com/node/15866/pdf>.

³⁴⁵ Supplemented Consolidated Complaint, ¶ 42.

³⁴⁶ See **Exhibit 17**.

³⁴⁷ I identified no analyst reports published during this time. An article published on May 31, 2022 reports on a Form 4 filing. After market hours on May 31, 2022, a Form 4 was filed reporting that Nadav Friedmann exercised options and held the obtained shares (after covering the strike price for the exercise). See Cassava Sciences, Inc., Form 4, filed May 31, 2022.

³⁴⁸ Supplemented Consolidated Complaint, ¶¶ 15, 34, 41, Supp. ¶ 5.

efficiency, as described in **Section V** above,³⁴⁹ and would also not be consistent with his reliance on one-day residual returns in testing for market efficiency.^{350:351}

167. In sum, as shown in **Exhibit 17**, on the majority of days on which I understand Plaintiffs allege corrective information came to the market or the market continued to react to allegedly corrective information, Cassava's stock price did not experience a statistically significant residual stock price decline in any of Dr. Feinstein's event study models. In his deposition, Dr. Feinstein said he might or might not exclude statistically significant alleged corrective disclosure dates from his damages analysis.³⁵² However, on the dates where there are no statistically significant price declines, there is no scientific basis to conclude that the declines were not caused by random variation in the stock price. Dr. Feinstein's high-level discussion of his proposed damages model fails to explain how, when estimating inflation, he will account for the absence of statistically significant price declines associated with these alleged corrective disclosures.

IX. Dr. Feinstein Fails to Put Forth a Class-wide Damages Methodology Consistent with Plaintiffs' Theory of Liability

168. I understand that at the class certification stage, securities class action plaintiffs must establish the existence of a methodology for calculating class-wide damages that is consistent with Plaintiffs' theory of liability in the case. Accordingly, it is my understanding that any model that would ultimately be used to estimate damages must necessarily have the ability to

³⁴⁹ As discussed in **Section V**, the efficient market hypothesis holds that stock prices adjust quickly to new, value-relevant public information about the stock. See Ross et al. (2010), p. 435 ("A market is semistrong form efficient if prices reflect (incorporate) all publicly available information, including information such as published accounting statements for the firm, as well as historical price information. ... However, if the market is semistrong form efficient, the price should rise immediately upon the news release."). See also, J. T. Greene and S. G. Watts (1996), "Price Discovery on the NYSE and the NASDAQ: The Case of Overnight and Daytime News Releases," *Financial Management* 25(1), pp. 19–42; J. A. Busse and T. C. Green (2002), "Market Efficiency in Real Time," *Journal of Financial Economics* 65(3), pp. 415–437.

³⁵⁰ See Feinstein Report, Section VIII. While Dr. Feinstein agreed in his deposition that his "collective event study" seeks to test Cassava's stock price response within one day of information being released, he stated that he "didn't make any assumption that the stock price couldn't move additionally on the second day as the market continued to process information. It very well could have, which is still efficient according to the literature for certain kinds of information that are complicated to evaluate."). See Feinstein Deposition, 126:22–127:3.

³⁵¹ A price reaction that supposedly lasts more than one trading day would also introduce numerous complications to any attempt to measure damages, which Dr. Feinstein does not even attempt to address. For example, if Dr. Feinstein plans to use "generally accepted valuation tools" to measure the valuation impact of a hypothetical disclosure, he has provided no methodology that explains how he would determine *when* that information would be fully incorporated into Cassava's price, if that information would not have affected Cassava's stock price when it was made but sometime over the next multiple days, or how he would measure how much the inflation band would have changed on each day in between the information's release and its ultimate incorporation into the stock price.

³⁵² Feinstein Deposition, 245:10–245:14 ("Q. Would you exclude the residual returns from any alleged corrective disclosure dates associated with no statistically significant price change [when estimating damages]? A. I'm not sure yet. There might be a reason to do that; there might be a reason not to do that.").

disaggregate removal of inflation as well as economic losses attributable to the correction of any alleged misstatements and omissions from those resulting from other causes. As discussed in this section, Dr. Feinstein has not shown that he can overcome economic issues specific to the facts and allegations in this litigation and ultimately develop such a damages model.

169. As noted above, Dr. Feinstein provides a high-level generic description of his proposed damages approach, which I summarize in **Section IX.A**. However, as I discuss in the remainder of this section, Dr. Feinstein fails to explain how he would tailor the generic approaches he describes to reliably address the specific features of the matter at hand in a manner that is consistent with Plaintiffs' theory of liability.

170. As discussed in **Section IX.B**, Dr. Feinstein has not explained how he could separately estimate damages associated with different categories of allegations, if required. Several of the alleged corrective disclosures discussed by Plaintiffs simultaneously disclose information related to different categories of alleged misrepresentations. In his deposition, Dr. Feinstein appeared to claim that under a so-called "scheme theory of liability," one does not need to match alleged corrective disclosures with the (different categories) of alleged misrepresentations when assessing inflation using the stock price declines.³⁵³ Not only did Dr. Feinstein provide no support for such a claim, he also failed to specify what "valuation tools" could be reliably used to estimate the impact of disclosures related to different categories of misrepresentations, if required. Put differently, he has put forth no methodology to address how the price reactions to the various alleged corrective disclosures can be economically tied to removal of price inflation caused by each of the four categories of misrepresentations that Plaintiffs allege.

171. Dr. Feinstein suggests that he would estimate inflation by "working chronologically backwards from the final corrective disclosure" using the residual price declines on alleged corrective disclosure dates.³⁵⁴ However, As discussed in **Section IX.C**, Dr. Feinstein fails to explain how his proposed damages methodology could measure Cassava's stock price movement attributable to revelation of the facts allegedly misrepresented, rather than negative impact from other information or discussions that would potentially have weighed

³⁵³ Feinstein Deposition, 271:19–271:23 ("Q. So is it your view the matching of misrepresentations and corrective disclosures may not be necessary here because of the scheme theory of liability? A. Exactly.").

³⁵⁴ Feinstein Report, ¶ 230 ("[A]n inflation ribbon would be constructed, using generally accepted empirical analysis and valuation tools ... [t]he inflation ribbon is often constructed by working chronologically backwards from the final corrective disclosure back to the start of the Class Period, accounting for alleged fraud-related residual price declines as they occurred.")

negatively on the Company's stock price. Dr. Feinstein does not explain how he would estimate the impact of a "but-for" disclosure by the Company earlier in the Proposed Class Period, as opposed to commentary by third parties that were critical of Cassava, or uncertainty associated with third-party investigations and regulatory processes. Further, Dr. Feinstein has not explained how he could reliably ascertain whether the large stock price declines following the alleged corrective disclosures were due to allegedly corrective information, or say, due to abatement of the impact from the meme stock phenomenon, which Dr. Feinstein failed to reliably address.

172. Dr. Feinstein also does not explain how he could reliably estimate inflation *throughout* the Proposed Class Period. As discussed in **Section IX.D**, given the size of the residual price declines on some alleged corrective disclosure dates, constructing an inflation band by "working chronologically backwards" using the residual dollar price declines on alleged corrective disclosure dates, as Dr. Feinstein appears to suggest, implausibly implies that Cassava's stock price would have been negative for much of the *first year* of the Proposed Class Period, but for the alleged misrepresentations. Given the particular pattern of Cassava's stock price movements during the Proposed Class Period, as well as the "meme stock phenomenon" that I have discussed in **Section VI**, Dr. Feinstein has not established that the residual price declines on the alleged corrective disclosure dates can reliably be used to estimate the amount of inflation removed on that day or to provide a reliable measure of inflation earlier in the Proposed Class Period. Dr. Feinstein also does not explain how he will account for changes over the course of the Proposed Class Period in what Cassava could have disclosed earlier, or for changes over the course of the Proposed Class Period in the value impact of such "but-for" disclosures.

173. Finally, as discussed in **Section IX.E**, Dr. Feinstein's proposed damages approach for the Cassava options explicitly relies on his ability to reliably estimate inflation in Cassava's stock price. Consequently, it is necessarily impaired by any flaws in Dr. Feinstein's estimate of stock price inflation. In addition, the implicit assumption in Dr. Feinstein's proposed option damages methodology that new public information about the Company was rapidly incorporated in *each* call or put option is not supported by his market efficiency analysis that investigates only a portfolio of options and does not test the efficiency of each Cassava option series individually. Moreover, Dr. Feinstein proposes to use theoretical option pricing models to estimate options inflation, yet Dr. Feinstein has conducted no analysis to establish whether such theoretical option pricing relationships were reflected in the actual prices of

options traded during the Proposed Class Period. My analysis of Dr. Feinstein's synthetic stock price suggests that some such relationships did not consistently hold. Dr. Feinstein also fails to explain how he would estimate the expected volatility that would have prevailed but-for the alleged misrepresentations in order to reliably estimate "but-for" option prices using the theoretical relationships he proposes. Finally, Dr. Feinstein fails to explain how he will determine that Cassava's put option price were "artificially depressed" and ignores that some members of the proposed class may have traded in multiple securities, potentially *benefitting* from the alleged fraud for certain trades or securities, while being harmed for others.

A. Summary of Dr. Feinstein's Proposed Approach for Common Stock Damages

174. To assess Section 10(b) damages for the Company's common stock, Dr. Feinstein states that he will use the "out-of-pocket" method, which is "measured as the difference between the amount of stock price inflation at purchase and the amount of inflation in the stock price at sale or, if held, at the end of the Class Period, taking into account formulaic prescriptions in relevant case law and statutes."³⁵⁵ As an initial matter, while Dr. Feinstein's discussion describes what he would use as a general, conceptual *measure* of damages (*i.e.*, inflation at purchase less inflation at sale), it does not, in and of itself, describe a scientific and reliable *methodology* for estimating damages (*e.g.*, how inflation could be calculated).

175. Dr. Feinstein describes three broad steps that would be part of estimating per-security damages:

- a. "First, valuation tools, which would include event study analysis, and potentially other empirical analyses, if necessary, would be used to establish if corrective disclosures caused the price of the Cassava Securities to fall."³⁵⁶
- b. "Second, an inflation ribbon would be constructed, using generally accepted empirical analysis and valuation tools, indicating how much artificial inflation caused by the alleged fraud was in the price of the Cassava Securities on each day during the Class Period, if any."³⁵⁷
- c. "Third, the measure of per-security damages generally applied in Section 10(b) cases is the reduction in the inflation ribbon over an investor's holding

³⁵⁵ Feinstein Report, ¶ 225.

³⁵⁶ Feinstein Report, ¶ 230.

³⁵⁷ Feinstein Report, ¶ 230.

period (the economic/inflation loss). That is, for each Class member, per-security damages would be calculated as the difference between the inflation on the date the securities were purchased and the inflation on the date those same securities were subsequently sold.”³⁵⁸

176. In terms of quantifying inflation, Dr. Feinstein further explains that “[a]n inflation ribbon is a time series of the difference between a security’s actual price observed in the marketplace, and the estimated price that the security would have traded at each day had there been full disclosure.”³⁵⁹ He states that “[c]onstruction of the inflation ribbon generally employs event study analysis, combined with widely used and generally accepted valuation tools” and that the “inflation ribbon is often constructed by working chronologically backwards from the final corrective disclosure back to the start of the [Proposed] Class Period, accounting for alleged fraud-related residual price declines as they occurred.”³⁶⁰

177. Instead of articulating how he might be able to reliably estimate inflation in a manner consistent with Plaintiffs’ theory of liability and the specific features of this case, Dr. Feinstein thus outlines a vague, broad, and generic description of possible approaches. Without discussing any specific features of this case or how he would tackle such challenges, Dr. Feinstein simply asserts that his proposed methodology would “enable[] computation of the artificial inflation ribbon even in cases where there is confounding information, changes in the concealed information, and changes in the value of the concealed information, among other potential complexities.”³⁶¹ Without discussing whether any of these challenges apply to this matter, he simply asserts that he could rely on “the full array of generally accepted and widely used valuation tools.”³⁶²

178. To be clear, my understanding is that plaintiff experts need not establish the amount of economic losses caused by the alleged misrepresentations or calculate inflation or damages at this stage of the litigation, and I am not criticizing Dr. Feinstein for not having done so. Rather, my point is that his vague and generic references to the standard tools of financial economics and calculating inflation by “working chronologically backwards from the final corrective disclosure” do not represent a methodology that a financial economist could

³⁵⁸ Feinstein Report, ¶ 230.

³⁵⁹ Feinstein Report, ¶ 230.

³⁶⁰ Feinstein Report, ¶ 230.

³⁶¹ Feinstein Report, ¶ 230.

³⁶² Feinstein Report, ¶ 230. Dr. Feinstein describes a broad array of “commonly used valuation tools,” but does not describe which might be applicable to estimating damages in this case or why. See Feinstein Report, ¶ 229.

implement to reliably measure damages in a manner consistent with Plaintiffs’ theory of liability in this matter. Dr. Feinstein fails to show that he has put forth a reliable damages methodology that can adequately address the various complications that I discuss in more detail below.

B. Dr. Feinstein Has Not Explained How His Damages Methodology Could Enable Him to Compute Inflation Separately for Each Category of Plaintiffs’ Alleged Misrepresentations

179. Dr. Feinstein has not explained how he could separately estimate the stock price impact on alleged corrective disclosure dates associated with different types of allegations, if required. As discussed in **Section III**, Plaintiffs describe the alleged misrepresentations as encompassing four distinct categories: (1) Cassava’s research, (2) alleged conflict of interests, (3) response to the Citizen Petition, and (4) government investigations. I understand that a damages methodology needs to be capable of identifying the amount of inflation that is attributable to only the actionable alleged misrepresentations, including if the finder of fact were ultimately to find Cassava liable for only a subset of the categories of alleged misrepresentations.

180. Dr. Feinstein has not explained how his proposed damages methodology could achieve this. Instead, during his deposition, he appeared to suggest that he did not need to explain how one can tie the stock returns associated with the various alleged corrective disclosures to measure inflation attributed to the various categories of alleged misrepresentations, because the alleged misrepresentations collectively were to perpetuate a “scheme.”³⁶³ Dr. Feinstein provided no further support or analysis for this claim.

181. Several of the alleged corrective disclosures discussed by Plaintiffs appear to include information related to different categories of alleged misrepresentations.

- a. For example, Plaintiffs allege that the Citizen Petition that became public after market hours on August 24, 2021 both “claimed that the foundational pre-clinical and clinical evidence supporting the continued development of simufilam as a treatment for Alzheimer’s had been manipulated” (which I understand relates to alleged misrepresentations regarding “Cassava’s

³⁶³ Dr. Feinstein instead claimed in his deposition that “the nature of the alleged misrepresentations and omissions collectively [was] that they were to perpetuate, perpetrate, and conceal a scheme,” and therefore “the economic impact ... can be corrected, at least partially, with disclosures that don’t mirror the alleged misrepresentations.” See Feinstein Deposition, 267:12–267:19, 268:15–268:19.

Research”) and also revealed that “the purported ‘outside’ lab that conducted the Phase 2b reanalysis was none other than Dr. Wang” (which I understand relates to alleged misrepresentations regarding “Conflicts of Interest”).³⁶⁴

- b. As another example, Plaintiffs allege that the *Wall Street Journal* article published on November 17, 2021 disclosed that Cassava was being investigated by the SEC and NIH (which I understand relates to alleged misrepresentations regarding “Government Investigations”), “confirmed that ‘Cassava pays Dr. Wang as a consultant,’” (which I understand relates to alleged misrepresentations regarding “Conflicts of Interest”), and also describes negative commentary from scientists regarding Cassava’s research.³⁶⁵

182. Dr. Feinstein fails to explain what “valuation tools” could be used to estimate the impact of disclosures related to different categories of alleged misrepresentations, if required. An event study alone—which is a specific technique used by financial economists, not a damages model—is not sufficient to separate the economic impact of allegedly corrective information concerning the different categories of alleged misrepresentations if such information was disclosed simultaneously.

183. Likewise, I understand that Plaintiffs’ allegations about alleged manipulation in the reporting of research related to simufilam span (i) pre-clinical research, (ii) Phase 2a trial, (iii) Phase 2b trial, and (iv) an open label extension of the Phase 2b trial.³⁶⁶ Dr. Feinstein has not explained how he would calculate damages if Plaintiffs ultimately prove that only some of the data contained errors, or if the errors had limited implications for the expected efficacy of simufilam (*e.g.*, biomarker data in clinical trial and not the results from pre-clinical studies, or if Defendants were found to be liable only for erroneous data shown on Cassava’s poster on July 26, 2021 at the AAIC conference).³⁶⁷

184. Relatedly, Dr. Feinstein also has not examined how the price reactions to the various alleged corrective disclosures can be economically tied to removal of price inflation caused by the four categories of misrepresentations that Plaintiffs allege. For example, Plaintiffs allege as one category of alleged misrepresentations “Conflicts of Interest.” However,

³⁶⁴ Supplemented Consolidated Complaint, ¶¶ 12–13; Plaintiffs’ Opposition to MTD, pp. 7–8.

³⁶⁵ Supplemented Consolidated Complaint, ¶¶ 28, 58, 370.

³⁶⁶ Plaintiffs’ Opposition to MTD, pp. 14, 18.

³⁶⁷ In his deposition, Dr. Feinstein acknowledged the distinction between cognition-related, behavior-related, and biomarker data but stated that he hadn’t “determined whether it is or is not relevant to calculating damages.” See Feinstein Deposition, 219:22–220:12.

Plaintiffs do not allege that there is a day where the only allegedly corrective disclosure is information related to “Conflicts of Interest.” Instead, as noted above, on two dates on which information related to “Conflicts of Interest” was allegedly disclosed, information related to other categories of allegations was simultaneously disclosed. Dr. Feinstein thus fails to explain how he could estimate the removal of inflation related to “Conflicts of Interest,” if required.

185. As **Exhibit 17** shows, despite the fact that some of the Plaintiffs’ allegations focus on alleged data manipulation in Cassava’s research and clinical trial results, numerous alleged corrective disclosures related specifically to this category—*e.g.*, journal article retractions or Citizen Petition supplements that allegedly identified data errors—are not associated with statistically significant price declines for Cassava’s stock.³⁶⁸ Instead, four of the alleged corrective disclosures that are associated with statistically significant price declines involve negative press coverage regarding collateral consequences such as government or other investigations (*i.e.*, the *Wall Street Journal* article on November 17, 2021; the *New York Times* article on April 18, 2022; the *Reuters* article on July 27, 2022; and the *Science* article on October 12, 2023).³⁶⁹ Thus, Dr. Feinstein does not explain how he would account for alleged corrective disclosure dates that are not associated with statistically significant price declines and estimate the removal of inflation related to “Cassava’s Research,” if required.

186. Similarly, Plaintiffs allege as one category of alleged misrepresentations “Misstatements in Cassava’s Response to the Citizen Petition.”³⁷⁰ Specifically, Plaintiffs allege that “in response to the finding [in the Citizen Petition] that Cassava’s P-tau181 plasma biomarker data in the July 26, 2020 AAIC’s presentation had been manipulated, Cassava claimed that the data had been ‘generated by [Quanterix], an independent company’” and that “the plasma P-tau181 data point missing from the AAIC poster had only ‘increased by

³⁶⁸ Specifically, as shown in **Exhibit 17**, neither of the disclosures related to expressions of concerns by journals (*i.e.*, the *Journal of Neuroscience* expression of concern on December 17, 2021 and the *Neurobiology of Aging* expression of concern on March 22, 2022), nor any of the alleged disclosures related to the retraction of journal articles (*i.e.*, *Molecular Neurodegeneration* on January 3, 2022; *PLOS One* on March 30, 2022; and *Alzheimer’s Research & Therapy* on June 1, 2022), were associated with statistically significant price declines in Dr. Feinstein’s event study models. Likewise, as also shown in **Exhibit 17**, the Citizen Petition supplements disclosed on August 30, 2021 and December 9, 2021 were not associated with statistically significant price declines. Plaintiffs do not appear to allege that the second supplement to the Citizens Petition disclosed on September 9, 2021 was a corrective disclosure. This date is not statistically significant in any of Dr. Feinstein’s event study models. The third supplement to the Citizens Petition became public on the same day as the *Wall Street Journal* article that is an alleged corrective disclosure. See Supplemented Consolidated Complaint ¶¶ 28–29, 227, 372; Feinstein Report, Exhibit 16–18.

³⁶⁹ See **Exhibit 17**.

³⁷⁰ Plaintiffs’ Opposition to MTD, p. 21.

38%.”³⁷¹ However, when a supplement to the Citizen Petition on August 30, 2021 claimed that the missing data on P-tau181 showed a 150% increase rather than a 38% increase,³⁷² the stock price reaction was *not* statistically significant.³⁷³ Thus, Dr. Feinstein again does not explain how he would account for alleged corrective disclosure dates that are not associated with statistically significant price declines and estimate the removal of inflation related to “Cassava’s Response to the Citizen Petition,” if required.

C. Dr. Feinstein Has Not Articulated How He Will Isolate Damages Attributable Only to Plaintiffs’ Theory of Liability

187. As discussed above, it is my understanding that any model that would ultimately be used to estimate damages must necessarily have the ability to measure removal of inflation attributable to the correction of any alleged misstatements and omissions from price declines resulting from other factors. Dr. Feinstein suggests that he would estimate inflation by “working chronologically backwards from the final corrective disclosure back to the start of the Class Period” using the residual price declines on alleged corrective disclosure dates.³⁷⁴ It appears that such an approach would thus critically rely on reliably estimating the residual price decline on the alleged corrective disclosure dates that is attributable only to the correction of the alleged fraud. Given the specific facts of the case discussed below, Dr. Feinstein fails to explain how he could reliably isolate only the inflation stemming from the alleged misrepresentations (and not from any other causes).

188. First, Dr. Feinstein stated in his deposition that opinions by third parties can be “material” to market participants.³⁷⁵ However, given that some allegedly corrective disclosures were commentary made by third parties rather than the Company itself (including the Citizen Petition or its supplements, or interviews with scientists in the *Wall Street Journal* and *New York Times* articles), Dr. Feinstein does not explain how he would estimate the impact of a “but-for” disclosure by the Company itself earlier in the Proposed Class Period, as compared to commentary by third parties that were critical of Cassava.

189. As an example, Plaintiffs include a “New York Times exposé” on April 18, 2022 in their discussion of allegedly corrective events (and in fact attribute the stock price decline

³⁷¹ Plaintiffs’ Opposition to MTD, p. 21.

³⁷² Supplemented Consolidated Complaint, ¶¶ 319, 328–330; Plaintiffs’ Opposition to MTD, p. 21.

³⁷³ See **Exhibit 17**.

³⁷⁴ Feinstein Report, ¶ 230.

³⁷⁵ Feinstein Deposition, 86:2–86:5.

over *two* trading days to news of the article).³⁷⁶ However, the article discusses factual information that had been made public multiple times earlier.³⁷⁷ Additionally, the article describes the opinions of “nine prominent experts,” who appeared to affirm the concerns of individuals that had already made public statements about Cassava (and some of the same individuals’ views had previously been reported in the public press).³⁷⁸ Indeed, Dr. Feinstein summarizes the article as reflecting “a growing scientific community consensus that the Company’s research was suspect.”³⁷⁹ However, Dr. Feinstein fails to describe how, using the residual price decline for the day, he would be able to isolate only the price impact of a “but-for” disclosure that is tied to Plaintiffs’ theory of liability, *i.e.*, an earlier disclosure of supposedly truthful information concerning its research and clinical results by the Company, exclusive of any negative impact from critical commentary (rather than new, corrective factual information) that would potentially have weighed negatively on the Company’s future operations and therefore stock price.

190. Likewise, Plaintiffs do not allege that Cassava could have disclosed earlier in the Proposed Class Period the content of the leaked CUNY document (*i.e.*, the final alleged corrective disclosure), which evaluated Dr. Wang’s work beyond his work related to simufilam and also criticized Dr. Wang’s record-keeping procedures in his academic research in general (which are topics that I understand Plaintiffs do not allege that Defendants concealed).³⁸⁰ Again, Dr. Feinstein does not describe how, using the residual price decline following the release of the CUNY document, he would be able to measure the price impact of a “but-for” disclosure by the Company concerning the purported truth of Cassava’s research and clinical results. He provides no methodology to determine that price impact.

191. Similarly, Plaintiffs allege that corrective information was disclosed on March 30, 2022 when Plos One retracted five papers by Dr. Wang and his co-authors.³⁸¹ However, while one of the five papers “was one of those criticized in the citizens petition” about

³⁷⁶ Supplemented Consolidated Complaint, ¶ 40; Feinstein Report, ¶ 52.

³⁷⁷ For example, the article describes developments that had previously been publicized, including the Citizens Petition and FDA response, and expressions of concern or article retractions by various journals. See “Scientists Question Data Behind an Experimental Alzheimer’s Drug,” *The New York Times*, April 18, 2022.

³⁷⁸ See, e.g., Supplemented Consolidated Complaint, ¶¶ 426, 428, 430. See also “Scientists Question Data Behind an Experimental Alzheimer’s Drug,” *The New York Times*, April 18, 2022; “Rebuttal to 8/25/21 Cassava Sciences Press Release,” *Business Wire*, August 26, 2021.

³⁷⁹ Feinstein Report, ¶ 53.

³⁸⁰ For example, Allegation 8 of the CUNY document relates to data in a study about prenatal cocaine exposure. See “Final Investigation Report of Associate Professor Hoau-Yan Wang, Ph.D.,” City University of New York, updated May 26, 2023, available at https://www.science.org/doi/10.1126/science.adl3444/full/cuny_wang_final_report-1698701360173.pdf. See also “Scientists Investigating Alzheimer’s Drug Faulted in Leaked Report,” *The New York Times*, October 14, 2023.

³⁸¹ Supplemented Consolidated Complaint, ¶¶ 39, 423–424.

Cassava, the subject of two of the papers was opioid tolerance and the subject of the other two papers was prenatal cocaine exposure.³⁸² Setting aside the lack of a statistically significant price decline on this date (see **Exhibit 17**), to the extent that the retraction of these other papers impacted Cassava's stock price by impacting Cassava's reputation by association, or otherwise, Dr. Feinstein does not describe how he would isolate the impact on this date of information related only to the alleged misrepresentations in this case.

192. Second, and relatedly, Dr. Feinstein does not explain how his proposed damages methodology could reliably measure the impact of the correction of alleged misrepresentations separately from the impact of uncertainty associated with third party investigations and regulatory processes.

193. To the extent that market participants anticipate potential negative regulatory actions from an investigation, given the various potential costs involved for the company, it is not surprising that the announcement of such an investigation may be associated with a negative stock price reaction. The potential negative price reactions to negative press coverage related to government investigations does not suggest, however, that the stock price decline necessarily reflects the incorporation of new, factual information concerning the alleged misrepresentations. Put differently, a company's stock price could decline following the announcement of a government investigation, even if market participants believe there is no merit to the government's claim, due to the various expected costs associated with defending the Company from the inquiry.

194. As an example of the potential impact from uncertainty, analysts described how the Citizen Petition created procedural uncertainty for the stock because it "requested the FDA to halt all ongoing studies of simufilam until the agency can verify the data Cassava had submitted thus far."³⁸³ The FDA's subsequent announcement that it would not halt ongoing clinical trials for simufilam and that it would not initiate an investigation based on the fact finding presented in the Citizen Petition was viewed as the "removal of a key overhang on the stock."³⁸⁴ To the extent that a hypothetical disclosure earlier in the Proposed Class Period

³⁸² See, e.g., "Five Studies Linked to Cassava Sciences Retracted," *Retraction Watch*, March 30, 2022.

³⁸³ "Connecting the Dots on One Roller Coaster of a Year for SAVA Shares," *Maxim Group*, November 11, 2021, FEINSTEIN_0001870, p. 3.

³⁸⁴ "FDA Denied Citizen's Petition Against Cassava, Removes A Key Overhang for the Time Being," *Jones Research*, February 10, 2022, FEINSTEIN_0000401, p. 1. See also "Citizen's Petition Denied, As Expected; Focus is now on the Drug and Phase 3 Program in Alzheimer's Disease," *Maxim Group*, February 10, 2022, FEINSTEIN_0001555, p. 1. ("Our position has been and remains grounded in following the data, the drug mechanism of action and the clinical trial outcomes. With the CP overhang now removed, the Cassava story, which came under attack in 2021, should be derisked from the perspective of the short thesis.").

would not have created equivalent uncertainty about FDA consent to continue clinical trials for simufilam, Dr. Feinstein has not provided a methodology to distinguish the impact of news in the Citizen Petition on August 25, 2021 from concern related to the potential for an FDA investigation based on the Citizen Petition, which later did not materialize.

195. As another example, analysts discussed how negative commentary and government investigations had impacted Cassava's research on simufilam because it had "materially impacted the ability of the ongoing phase 3 program in Alzheimer's disease to enroll patients."³⁸⁵ Indeed, analysts remarked on the "overhang that [had] doggedly impacted Cassava stock in 2021, which at one point cast doubt whether the company would be able to initiate Phase 3 studies."³⁸⁶ Again, Dr. Feinstein has not explained how he could isolate the impact of allegedly corrective information on alleged corrective disclosure dates from the impact of uncertainty associated with third party investigations and regulatory processes. Ultimately, even after all the alleged corrective disclosures that have occurred, I understand that the Phase 3 trials are now fully enrolled and are ongoing.³⁸⁷

196. Third, as I have discussed in **Section VI**, in his market efficiency analysis, Dr. Feinstein has failed to assess whether the residual stock price movements during the Proposed Class Period were attributable to new, value-relevant information, or potentially impacted by the meme stock phenomenon. Cassava's stock experienced a substantial price run-up with heightened social media activity in 2021 before the first alleged corrective disclosure, and large price drops afterwards. Due to his deficient analysis of market efficiency, Dr. Feinstein has not explained how he could reliably ascertain whether the large stock price declines following the alleged corrective disclosures were due to allegedly corrective information, or say, due to abatement of the impact from the meme stock

³⁸⁵ "Suspension of Coverage Report," *Maxim Group*, April 26, 2022, FEINSTEIN_0001466, p. 1 ("There is continued uncertainty related to the simufilam data with five retracted papers in March 2022 by PLoS ONE (author Hoau-Yan Wang, a professor at the City University of New York, Cassava collaborator). In addition, there is uncertainty related to the ongoing SEC investigation. Combined with the impact of the Citizen's Petitions which were initially filed in August 2021 (since denied, as announced by Cassava in February 2022), short reports and other factors, the net result seems to have materially impacted the ability of the ongoing phase 3 program in Alzheimer's disease to enroll patients, with only ~60 patients of the needed 1,750 enrolled as per a company update in March 2022."). Maxim stated in this report that it suspended coverage as a result of lack of clarity as to whether the phase 3 trial "can enroll efficiently."

³⁸⁶ "Showing It Can Do Big Things; Two Large Phase 3 Trials Initiated in 2021; Reiterate Buy and \$124 PT," *H.C. Wainwright*, March 1, 2022, FEINSTEIN_0001527.

³⁸⁷ "Cassava Sciences Announces Completion of an Interim Safety Review of Oral Simufilam On-going Phase 3 Trials," *Cassava Sciences*, March 25, 2024 ("The first Phase 3 trial (NCT04994483) has a 52-week treatment period; 804 Alzheimer's patients were randomized into this trial, as announced in October 2023. Top-line results for the 52-week Phase 3 trial are currently expected approximately year-end 2024. The second Phase 3 trial (NCT05026177) has a 76-week treatment period; 1,125 Alzheimer's patients were randomized into this trial, as announced in November 2023. Top-line results for the 76-week Phase 3 trial are currently expected approximately mid-year 2025.").

phenomenon. As he put it, he did not seek to assess whether “the stock price mov[ed] wildly with no good reason for moving wildly.”³⁸⁸

197. Dr. Feinstein states that he would be able to apply “the full array of generally accepted and widely used valuation tools” to enable the “computation of the artificial inflation ribbon even in cases where there is confounding information”³⁸⁹ However, apart from this vague claim, Dr. Feinstein does not provide a description of which tools would be applicable or *how* he would apply such tools in order to reliably estimate damages on each day of the Proposed Class Period. By relying on the price declines following the third-party announcements alleged by plaintiffs as corrective disclosures, Dr. Feinstein can, at best, measure the market reaction to the disclosed information; he cannot measure the impact of a hypothetical truthful disclosure that would potentially have been different than the alleged corrective disclosures.

198. Specifically, given that Cassava’s valuation depended critically on the likelihood of simufilam’s FDA approval, and eventual commercial success, estimating the impact of a hypothetical earlier disclosure would require an assessment of how such a hypothetical earlier disclosure would have impacted the prospects for simufilam. Indeed, Dr. Feinstein acknowledges that “equity analysts valued Cassava using present value methodologies that hinged on the assessed probability of success for Cassava’s pipeline product, simufilam, and estimates of projected cash flows that would eventually be achieved if the product would be approved and commercialized.”³⁹⁰ However, Dr. Feinstein provides only a generic description of “valuation tools” and does not describe how those tools would allow him to estimate how the market would have evaluated differently the probability of simufilam becoming a commercial drug under a hypothetical earlier disclosure, relative to the disclosures that actually occurred.

199. Notably, there are no analyst reports following some alleged corrective disclosures, such as the *Wall Street Journal* article on November 17, 2021. As discussed in **Section VI.C.2**, several analysts dropped coverage toward the end of the Proposed Class Period. As such, Dr. Feinstein cannot presume he would be able to rely on commentary or valuation by equity analysts as an input to his damages methodology. Moreover, two of the equity analysts that continued to cover Cassava after the majority of the alleged corrective

³⁸⁸ Feinstein Deposition, 143:11–143:20.

³⁸⁹ Feinstein Report, ¶ 230. See *also* Feinstein Deposition, 253:9–253:21; Feinstein Report, ¶ 229.

³⁹⁰ Feinstein Report, ¶ 134, Appendix 1.

disclosures had occurred retained price targets of at least \$100.³⁹¹ Dr. Feinstein would need to reconcile his purported damages approach that uses stock price drops as a measure of removal of inflation with the fact that some analysts kept the long-run price target mostly unchanged after the release of the allegedly corrective information.³⁹²

200. In light of these case-specific features discussed above, Dr. Feinstein thus fails to explain how his purported damages methodology could isolate the portion of Cassava's stock price movement attributable only to revelation of the facts allegedly misrepresented, exclusive of any negative impact from information that is not causally linked to the alleged misrepresentations.

D. Dr. Feinstein Has Not Articulated How He Will Derive a Reliable Measure of Inflation Throughout the Proposed Class Period Given the Changing Information Mix and Pattern of Price Movements of Cassava's Stock

201. In order to calculate damages as inflation at the time of purchase less inflation at the time of sale (*i.e.*, the "out-of-pocket" method Dr. Feinstein describes), Dr. Feinstein would require a measure of inflation on each day of the Proposed Class Period. However, Dr. Feinstein has not articulated how he could reliably estimate inflation throughout the Proposed Class Period.

202. First, "working chronologically backwards" using the residual price declines, in dollar terms, could imply a negative stock price in the early part of the Proposed Class Period, given the pattern of price movements of Cassava's stock during the Proposed Class Period.³⁹³ This occurs because the sum of the residual price declines in dollar terms from Dr. Feinstein's event study on the alleged corrective disclosure dates is in fact larger than Cassava's stock price for much of the first year of the Proposed Class Period.

203. **Exhibit 18** illustrates the implementation of a constant dollar measure of inflation throughout the Proposed Class Period using the residual dollar price declines on the alleged

³⁹¹ See, e.g., "2Q22-2X Larger Cohort Data at 12 Months Continue to Show Cognition Improvement in Alzheimer's Patients," *Jones Research*, August 3, 2022, FEINSTEIN_0000422; "A Gem Emerges in 12-Month Open-Label Study Data; Reiterate Buy and \$124 PT," *H.C. Wainwright*, August 4, 2022, FEINSTEIN_0001302.

³⁹² Further, in its last report published before the end of the Proposed Class Period, H.C. Wainwright assigned the same "65% clinical program probability of success" (on which Dr. Feinstein stated that analysts' valuation methodologies "hinged") that it applied in its valuation of Cassava prior to the first alleged corrective disclosure. See "Enrollment Complete in First Pivotal Simufilam Phase 3; Reiterate Buy Rating and \$124 PT," *H.C. Wainwright*, October 4, 2023, FEINSTEIN_0000739, p. 2.

³⁹³ Feinstein Report, ¶ 230 ("[A]n inflation ribbon would be constructed, using generally accepted empirical analysis and valuation tools ... [t]he inflation ribbon is often constructed by working chronologically backwards from the final corrective disclosure back to the start of the Class Period, accounting for alleged fraud-related residual price declines as they occurred.")

corrective disclosure dates from Dr. Feinstein’s event study. As shown in the exhibit, given the size of the residual price declines, constructing an inflation band by “working chronologically backwards” using the residual dollar price declines on alleged corrective disclosure dates, as Dr. Feinstein appears to suggest, implausibly implies that Cassava’s “but-for” stock price would have been *negative* for much of the *first year* of the Proposed Class Period.³⁹⁴ In other words, absent other adjustments that Dr. Feinstein has not described, Dr. Feinstein’s proposed approach to estimating inflation could lead to economically nonsensical results—namely, inflation larger than the actual stock price—and therefore could not be used to reliably estimate inflation (and therefore damages).³⁹⁵

204. More generally, as noted above, given the substantial volatility in Cassava’s stock price during the Proposed Class Period—including during the period in which Cassava experienced price movements that significantly exceeded broader market movements and was characterized by some market commentators as a meme stock—Dr. Feinstein has not established that the residual price declines on alleged corrective disclosure dates can reliably be used to estimate the amount of inflation removed on that day or to provide a reliable measure of inflation earlier in the Proposed Class Period.

205. Second, Plaintiffs do not allege that Cassava could have disclosed earlier with certainty that it would be investigated by regulatory agencies. Indeed, Plaintiffs allege only that Defendants failed to disclose that “there was a *reasonable likelihood* that Cassava would face regulatory scrutiny in connection with the development of simufilam.”³⁹⁶ Likewise, Plaintiffs do not allege that Cassava could have earlier disclosed with certainty the need for an investigation into Dr. Wang by CUNY, or the outcome of the CUNY investigation.³⁹⁷ Thus, Dr. Feinstein does not articulate how he could reliably estimate inflation throughout the Proposed Class Period in a way that would account for what Cassava *could* hypothetically have disclosed earlier in the Proposed Class Period, or potentially account for changing probabilities during the Proposed Class Period related to these investigations.

³⁹⁴ To the extent Dr. Feinstein would assume that inflation would be capped such that the stock price would be \$0, and not negative, during this period, he would need to demonstrate that Cassava’s stock would have been worthless had the purported “truth” been revealed at the start of the Proposed Class Period. He has not presented any evidence to support such an assumption.

³⁹⁵ To the extent Dr. Feinstein would suggest that this problem can be addressed by assuming constant percentage (rather than constant dollar) inflation, that would imply that the value of the alleged misrepresentations was exactly proportional to the value of the Company on each day of the Proposed Class Period. Dr. Feinstein has not articulated why such an assumption would be justified, as a matter of economics, in this case, or how such an assumption is consistent with developments and circumstances of the Company, the industry, or the overall market during the Proposed Class Period.

³⁹⁶ Supplemented Consolidated Complaint, ¶ 287 (emphasis added).

³⁹⁷ “CUNY Halts Investigation of Alzheimer’s Researcher,” *The New York Times*, October 28, 2023.

206. Third, Dr. Feinstein does not explain how he will account for changes over the course of the Proposed Class Period in the value impact of what Cassava could have disclosed earlier. For example, Dr. Feinstein does not address how changes in industry conditions could have impacted the value of the alleged misrepresentations at different points in the Proposed Class Period.³⁹⁸ For example, analysts commented on how Cassava's valuation was impacted by optimism in the industry for Alzheimer's drugs, including as a result of approval of Biogen's aducanumab Alzheimer's drug treatment in June 2021.³⁹⁹

207. Dr. Feinstein states that he would be able to apply "the full array of generally accepted and widely used valuation tools" to enable the "computation of the artificial inflation ribbon even in cases where there is ... changes in the concealed information, and changes in the value of the concealed information, among other potential complexities."⁴⁰⁰ However, apart from this vague claim, Dr. Feinstein again does not provide a description of which tools would be applicable or *how* he would apply such tools in order to reliably estimate damages on each day of the Proposed Class Period.

E. Dr. Feinstein Fails to Articulate a Damages Methodology for Options That Can Measure Damages Consistent with Plaintiffs' Theory of Liability

208. Dr. Feinstein's addresses options in a single paragraph in his damages methodology discussion. He states:

Stock options are derivative securities, whose values depend on the value of the underlying stock. If the underlying stock is artificially inflated, the price of call options on the stock will also be artificially inflated, and the price of put options will be artificially depressed. Given the inflation ribbon for the common stock, widely used and generally accepted option pricing formulas, such as the binomial American option pricing formula (the "Binomial model") or the Black-Scholes formula, can be used to determine how much artificial

³⁹⁸ Examining Dr. Feinstein's event study models reveals a large decline in explanatory power between the beginning and the end of the Proposed Class Period, suggesting that the importance of market and industry developments for Cassava's stock price changed over the course of the Proposed Class Period. At the beginning of the Proposed Class Period, approximately 65% of the variance in Cassava's stock returns can be explained by the market and industry returns; for most of the second half of the Proposed Class Period, these factors explain only about 10–15% of the variation in Cassava's stock price. See Feinstein Report, Exhibit 10, providing R-squared values that indicate the percentage of the variation in Cassava's stock returns explained by the market and industry factors. See J. M. Wooldridge (2013), *Introductory Econometrics: A Modern Approach*, 5th ed, Boston, MA: South-Western Cengage Learning, pp. 38, 202.

³⁹⁹ See, e.g., "Reiterating BUY/\$110 PT. Broad Approval of Biogen's Market Cap (\$BN) \$2.6 Alzheimer's Drug Bodes Well for Cassava," *Jones Trading*, June 7, 2021, FEINSTEIN_0000308.

⁴⁰⁰ Feinstein Report, ¶ 230.

inflation is in each call option on any given day and how much each put option price is artificially depressed.⁴⁰¹

209. Dr. Feinstein therefore appears to propose relying on the theoretical relationship between the value of the options and the value of the underlying stock to estimate inflation, rather than directly evaluating price inflation associated with the Cassava options. Dr. Feinstein’s brief description of such an approach fails to demonstrate that he can reliably overcome the economic challenges in calculating inflation for the Cassava options.

210. First, since Dr. Feinstein’s damages approach for the Cassava options explicitly relies on his ability to provide a class-wide methodology for calculating inflation in Cassava’s stock price that is consistent with Plaintiffs’ theory of liability, all of the issues discussed above with respect to calculating damages for the common stock apply equally to his proposed approach for the Cassava options.

211. Second, as Dr. Feinstein acknowledges, in order to determine damages for each option, inflation will need to be calculated individually for “*each* put option” and “*each* call option on any given day.”⁴⁰² Dr. Feinstein appears to suggest, as quoted above, that he would calculate inflation for each call option (or how much each put option was artificially depressed) as the difference between an option’s actual price and the option’s “but-for” price (calculated as a function of the “but-for” stock price).

212. An implicit assumption in such a calculation is that new public information about the Company was incorporated quickly and fully in the actual price of *each* call or put option. However, as discussed in **Section VII**, Dr. Feinstein fails to test market efficiency of any of the Cassava options individually. Instead, his conclusion that “Cassava options traded in an efficient market over the course of the Class Period”⁴⁰³ is based on analysis of a *portfolio* of options without evaluating any of the individual option contracts individually. As discussed above, Dr. Feinstein has not employed any event study or other methodology to measure the price impact of information for individual option series, and his analysis ignores the fact that each option contract trades as a unique instrument with distinct prices and differences in trading characteristics (*e.g.*, liquidity or trading costs).

⁴⁰¹ Feinstein Report, ¶ 226.

⁴⁰² Feinstein Report, ¶ 226 (emphasis added). Dr. Feinstein confirmed in his deposition that he would seek to calculate damages for each option individually. See Feinstein Deposition, 257:14–257:18.

⁴⁰³ Feinstein Report, ¶ 218.

213. Third, Dr. Feinstein explicitly states that he will use theoretical options pricing models, such as the “Binomial model” or the “Black-Scholes formula,” to estimate inflation for each option.⁴⁰⁴ However, Dr. Feinstein has conducted no analysis to establish whether such theoretical option pricing models price Cassava options accurately during the Proposed Class Period.

214. In fact, Dr. Feinstein’s analysis of his synthetic stock price suggests that some theoretical relationships between stock and options prices did not consistently hold. Specifically, as discussed in **Section VII.B**, Dr. Feinstein creates a synthetic stock price using the put-call parity relationship. As I show in **Exhibit 15**, he calculates a wide range of synthetic stock prices, which can deviate from the actual stock price by 30% or more. Given the evidence that prices of Cassava’s individual option series deviated from prices that would be implied by the theoretical relationships between stock and options, Dr. Feinstein has not explained how he would reliably use a theoretical relationship to measure inflation on a class-wide basis for all investors in these options. Similarly, Dr. Feinstein has not shown that (or explained why) it would be appropriate to treat options that did not conform to this theoretical relationship in the same manner as options that did.

215. Fourth, while Dr. Feinstein proposes to rely on theoretical pricing relationships for options, he has not articulated how he will reliably determine the inputs for those relationships. In particular, Dr. Feinstein proposes to use the stock price but-for the alleged misrepresentations as an input to estimating inflation in option prices, but does not explain how he could account for changes in the volatility of Cassava’s stock in his damages model for options.

216. As discussed in **Section VII.A**, volatility of the underlying stock is one of the inputs in options pricing and valuation. In particular, the expected volatility of the underlying stock price is an important input in the valuation of options (whether using the binomial model or Black-Scholes formula), because underlying stock prices that are more volatile will be more likely to meet the strike price of any options series, increasing the value of the options.⁴⁰⁵ To make the matter more challenging, different options may require different expected volatility inputs (*e.g.*, an option that expires in six months as compared to one that expires in one week requires an estimated expected volatility over a much longer horizon). Despite the

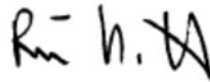
⁴⁰⁴ Feinstein Report, ¶ 226.

⁴⁰⁵ Hull (2015), p. 236.

importance of this input in valuing options, Dr. Feinstein fails to explain how he would estimate the option-specific expected volatility that would have prevailed but-for the alleged misrepresentations, and thereby reliably estimate the “but-for” prices of individual options in order to estimate options damages.

217. Finally, although Dr. Feinstein claims that “widely used and generally accepted option pricing formulas ... can be used to determine how much artificial inflation is in each call option on any given day and how much each put option price is artificially depressed,” he does not provide a methodology for measuring damages based upon this “artificial[] depress[ion]”⁴⁰⁶ in put option prices. Instead, he claims that “per-security damages would be calculated as the difference between the *inflation* on the date the securities were purchased and the inflation on the date those same securities were subsequently sold.”⁴⁰⁷ Putting the mechanics of translating inflation or “depress[ion]” into damages aside, Dr. Feinstein also ignores that some proposed class members may have traded in multiple securities, potentially *benefitting* from the alleged fraud for certain trades or securities, while being harmed for others.⁴⁰⁸ For example, consider an investor who buys Cassava’s stock but also simultaneously buys a put option to hedge against potential losses. If the investor held both securities over an alleged corrective disclosure date on which inflation was removed from the stock price, the investor’s stock position would have been harmed by the alleged fraud, but the investor’s put option position would have benefitted. Awarding this investor damages for the investor’s stock trade while ignoring the same investor’s trade of the put option would allow this investor to achieve a windfall.

Executed this 28th of June, 2024



René M. Stulz, Ph.D.

⁴⁰⁶ Feinstein Report, ¶ 226.

⁴⁰⁷ Feinstein Report, ¶ 230 (emphasis added).

⁴⁰⁸ Dr. Feinstein instead asserted in his deposition that “we call that ‘netting.’” It’s a legal determination, so I would take guidance from the Court. Some courts have said you should net profits and losses, and others say you don’t.” See Feinstein Deposition, 257:19–258:2.

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UNDERGRADUATE STUDIES

University of Neuchâtel, Switzerland, Licence es Sciences Économiques, 1975.

GRADUATE STUDIES

London School of Economics, 1975-1976, Visiting Graduate Student.

Massachusetts Institute of Technology (MIT), 1976-1980, Ph.D. in Economics.

ACADEMIC APPOINTMENTS

Ohio State University, Everett D. Reese Chair of Banking and Monetary Economics, 1996 to present.

University of Southern California, Visiting Professor, 2007.

University of Chicago, Visiting Professor, Stigler Center, 2003-2004.

Northwestern University, Visiting Scholar, Kellogg School of Management, 2003-2004.

Harvard University, Business School, August 1996 to July 1997, Bower Fellow.

Ohio State University, Director of the Dice Center for Research in Financial Economics, 1995 to present.

Ohio State University, Ralph Kurtz Chair in Finance, 1993-1996.

Ohio State University, Riklis Chair in Business and its Environments, 1988-1993.

Ohio State University, Professor of Finance, 1985 to present.

University of Chicago, Visiting Professor of Finance, 1986-1987.

Massachusetts Institute of Technology, Visiting Associate Professor of Finance, Fall 1985.

Ohio State University, Associate Professor of Finance, 1983-1985.

University of Rochester, Assistant Professor of Finance and Economics, 1980-1983.

OTHER POSITIONS

Research Associate, National Bureau of Economic Research (Asset Pricing Group and Corporate Finance Group).

Director, NBER Group on the Risks of Financial Institutions, 2005 to 2023.

Chairman, Scientific Council, Swiss Finance Institute, 2006 to 2019.

Finance Research Advisory Committee, Office of Financial Research, U.S. Treasury, 2016 to 2019.

Board of Directors, American Finance Association, 1988 to 2000, 2002 to 2006.

Consultant to the World Bank, the IMF, the NYSE, Federal Reserve Bank of New York, corporations, and law firms.

Expert testimony in federal courts, state courts, and domestic and international arbitrations.

Taught executives in Europe, Asia and North America (open enrollment as well as for corporations, courses on risk management, banking, derivatives, corporate valuation, investments).

Advisory Committee, Morningstar, 2000-2002.

Director, Banque Paribas, 2002 to 2020.

Director, Wegelin Fund Management, 1999 to 2010.

President, Gamma Foundation, 2002 to 2013.

Director, Community First Financial Group, Inc., 2001 to 2010.

Director, Peninsula Banking Group, Inc., 2001 to 2010.

Trustee, Global Association of Risk Professionals, 2002-2020; executive committee, 2004-2011; chair of governance committee, 2011-2020; vice-chair, 2017-2019.

Vice-Chairman, Board of Trustees, Global Association of Risk Professionals, 2019-2020.

Chairman, Financial Risk Management Examination Certification Committee, Global Association of Risk Professionals, 2002 to 2020.

Chairman, New York Federal Reserve Bank/GARP Global Risk Forum (2011, 2013, 2016, 2019), Bank of England/GARP Global Risk Forum (2012, 2014, 2017, 2020), Hong Kong Monetary Authority/GARP Global Risk Forum (2013, 2015).

International Advisory Committee, NCCR, 2002 to 2011.

External Reviewer, London Business School Finance Department, 2005; New York University Finance Department, 2022.

Financial Advisory Roundtable (FAR), Federal Reserve Bank of New York, 2006 to 2010.

Guest Contributor, Harvard Law School Corporate Governance Blog.

Squam Lake Group, member, 2008 to present.

Senior Academic Fellow, Asia Bureau of Finance and Economic Research, 2012 to 2023.

Fellow, Wharton Center for Financial Institutions, 2013 to present.

Nominating Committee, American Finance Association, 2004 (chair), 2016, 2018.

HONORS, SCHOLARSHIPS AND FELLOWSHIPS

Advanced Researcher Fellowship, Swiss National Science Foundation, 1978-1980.

Dean's Research Professorship, Ohio State University, Spring 1984.

Pacesetter Research Award, Ohio State University, April 1986.

President-Elect (1993) and President (1994), International Economics and Finance Society.

Docteur Honoris Causa, University of Neuchâtel, Switzerland, 1998.

Eastern Finance Association Scholar Award, 1998.

Selected keynote speeches: ABFER, Asia-Pacific Finance Association, Bank of the Netherlands Governance Conference, Bocconi Derivatives Annual Conference, Drexel Corporate Governance Conference, Eastern Finance Association, European Corporate Finance Institute, European Finance Association, European Financial Management Association, Financial Management Association, Financial Management Association European Conference, FDIC Annual

Conference, Rising Stars Conference, Fourth Annual Conference on Asia-Pacific Financial Markets of the Korean Securities Association, French Finance Association, German Finance Association, Infiniti Conference, Notre Dame/SEC Conference, Northern Finance Association, Swiss Banking Association 100th Anniversary Conference, Western Finance Association, World Finance Conference, China International Conference in Finance, South Carolina Conference on Banking and Fixed Income, Asian Finance Association Conference, Seoul Asian Financial Forum, Oklahoma University Energy and Commodities Finance Research Conference, ECGI Roundtable Riga, ECGI Annual Meeting, Institutional Investor Private Markets Summit, 7th HEC Paris Workshop, Asian Pacific Risk and Insurance Association, Institute for Private Capital Annual Research Conference.

Assurant Lecture, Georgia Tech University, 2004.

Fellow, Financial Management Association, 2000.

Fellow, American Finance Association, 2005.

Fellow, European Corporate Governance Institute, 2005.

Vice-President (2002), Program Chair, (2003), President (2004), Western Finance Association.

Vice-President (2002), President-elect (2003), President (2004), American Finance Association.

Who's Who in Banking and Finance; Who's Who in Economics.

Jensen Prize for best article in Corporate Finance in the Journal of Financial Economics, 2000, 2008, 2017; runner-up, 2011.

William F. Sharpe Award for the best paper published in the Journal of Financial and Quantitative Analysis during the year 2003.

Selected by the magazine Treasury and Risk Management as one of the 100 most influential people in finance (June 2004).

René M. Stulz Scholar Development Fund, created in 2005 by former Ph.D. students.

Fama/DFA Prize for best article in Capital Markets and Asset Pricing in the Journal of Financial Economics, 2005.

Nominated for a Brattle Prize for best paper in Corporate Finance in the Journal of Finance in 2005.

Risk Who's Who, Charter Member, 2006.

Best paper, First Asian-Pacific Capital Markets Conference, Seoul, 2006.

Outstanding Academic Contribution to Corporate Governance Award, Drexel University, 2009.

Risk Manager of the year award, Global Association of Risk Professionals, 2009.

Swiss Finance Institute/Banque Privée Espirito Santo Prize 2010.

Trailblazer in Finance Award, 2014.

Reuters, Highly-Cited Researchers, first time in 2014.

Ohio State University, Distinguished Scholar Award, 2016.

Special issue of the Journal of Applied Corporate Finance in honor of René M. Stulz, 2022.

Best Paper Award, Southern Finance Association Meeting, 2023.

Honorary Doctor of Laws, University College Dublin, 2023.

CONGRESSIONAL TESTIMONY

“Over-the-Counter Derivatives Markets Act of 2009,” testimony to the House of Representatives Committee on Financial Services, 2009.

“Oversight of the Mutual Fund Industry: Ensuring Market Stability and Investor Confidence,” Subcommittee on Capital Markets and Government Sponsored Enterprises, House of Representatives Committee on Financial Services, 2011.

BOOKS

Risk Management and Derivatives, Southwestern College Publishing, 2003.

Handbook of the Economics of Finance, volume 1, edited with George Constantinides and Milton Harris, North-Holland, 2003.

Handbook of the Economics of Finance, volume 2, edited with George Constantinides and Milton Harris, Elsevier, 2013.

International Capital Markets, 3 volumes, edited with Andrew Karolyi, Edward Elgar, 2003.

Readings for the Financial Risk Manager, edited with Richard Apostolik, Wiley, 2004.

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The Risks of Financial Institutions, edited with Mark Carey, University of Chicago Press, 2006.

The Squam Lake Report: Fixing the Financial System, co-authored with the Squam Lake Group, Princeton University Press, 2010.

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"On the Effects of Barriers to International Investment," *Journal of Finance*, 1981, 36(4), 923-934; reprinted in *Emerging Markets*, Geert Bekaert and Campbell R. Harvey, ed., Edward Elgar Publishing, 2004, 1-36.

"A Model of International Asset Pricing," *Journal of Financial Economics*, 1981, 9(4), 383-406.

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"Pricing Capital Assets in an International Setting: An Introduction," *Journal of International Business Studies* (Winter 1984), 55-73; reprinted in *International Financial Management: Theory and Applications*, Donald R. Lessard, ed., John Wiley & Sons, 1985.

"Macroeconomic Time-Series, Business Cycles and Macroeconomic Policies," with Walter Wasserfallen, *Carnegie-Rochester Conference Series on Public Policy* (Spring 1985), 9-55.

"An Analysis of Secured Debt," with Herb Johnson, *Journal of Financial Economics*, 1985, 14(4), 501-522, reprinted in *The Debt Market*, vol. 3, Steve A. Ross, editor, Edward Elgar, 2000.

"The Determinants of Firm's Hedging Policies," with Clifford W. Smith, *Journal of Financial and Quantitative Analysis*, 1985, 20(4), 391-406; reprinted in *Studies in Financial Institutions: Commercial Banks*, C. James and C.W. Smith, eds., McGraw Hill, 1993, and in *Corporate Hedging in Theory and Practice: Lessons from Metallgesellschaft*, Christopher L. Culp and Merton H. Miller, eds., Risk Publications, London, 1999.

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"Interest Rates and Monetary Policy Uncertainty," *Journal of Monetary Economics*, 1986, 17(3), 331-348.

"Time-Varying Risk Premia, Imperfect Information and the Forward Exchange Rate," *International Journal of Forecasting*, 1987, 3(1), 171-178.

"The Pricing of Options with Default Risk," with Herb Johnson, *Journal of Finance*, 1987, 42(2), 267-280.

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Editorial Board, Journal of Financial Intermediation, 2013 to present.

Advisory Editor, Journal of Investment Management, 2003 to present.

Advisory Editor, Journal of Financial Economics, 2000 to 2021.

Advisory Editor, Journal of Financial Services, 1999 to present.

Editor, Journal of Finance, 1988 to 2000.

Editor, Corporate Finance Abstracts, Social Science Research Network, 1998 to present.

Editor, Journal of Financial Economics, 1982 to 1987.

Board of Editors, Journal of Banking and Finance, 2008.

Co-Editor, Banking and Financial Institutions Abstracts, Social Science Research Network, 1998 to present.

Co-Editor, Financial Markets and Portfolio Management, 1999 to present.

Associate Editor, Journal of Risk, 2006 to present.

Board of Editors, Japan and the World Economy, 2006 to present.

Advisory Editor, The Review of Finance, 2003 to 2009.

Advisory Editor, Journal of Economic Perspectives, 2006 to 2008.

Associate Editor, Journal of Economic Perspectives, 2003 to 2005.

Associate Editor, Journal of Financial Abstracts, 1994 to 1998.

Associate Editor, Journal of Financial Economics, 1988 to 1999.

Associate Editor, Journal of International Finance and Accounting, 1988 to present.

Associate Editor, Global Finance Journal, 1988 to 2015.

Associate Editor, Journal of International Financial Markets, Institutions and Money, 1989 to present.

Associate Editor, Journal of Fixed Income, 1991 to present.

Associate Editor, Journal of International Trade and Finance, 1992 to present.

Associate Editor, Journal of Financial and Quantitative Analysis, 1983-1985.

Acted as an ad hoc referee for AER, JIE, JAE, JFE, JME, JMCB, JFQA, QJE, JF, JB, JPE, Canadian Journal of Economics, Management Science, Marketing Science, Journal of International Money and Finance, Journal of International Business Studies, the Canadian NSF and the NSF.

Deposition and Trial Testimony of René M. Stulz During the Past Four Years

Case Name: Lord Abbett Affiliated Fund, Inc. et al. v. Navient Corporation et al.
Case No.: No. 1:16-cv-00112-MN, United States District Court, District of Delaware
Date of Testimony: December 2019 (Deposition), June 2021 (Deposition)

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- “The World’s Most Influential Scientific Minds,” *Thomson Reuters*, December 2015, available at https://www.ludwigcancerresearch.org/wp-content/uploads/2018/09/37a987a9-e378-4888-8baa-d4ba20efdbfd_tr_scientific_minds_online_final.pdf
- “These Are the 10 Most Popular Stocks on Reddit’s WallStreetBets Forum,” *Business Insider*, December 21, 2021, available at <https://markets.businessinsider.com/news/stocks/top-10-wall-street-bets-stocks-tesla-micron-most-mentioned-2021-12>
- “Today’s Stock Market Is the Exception, Not The Rule,” *Finimize*, available at <https://finimize.com/content/what-gamestop-bubble-teaches-us-about-stock-markets>
- “Troubles mount for Cassava Sciences, as patient enrollment lags for Alzheimer’s drug studies,” *Stat+*, April 5, 2022, available at <https://www.statnews.com/2022/04/05/troubles-mount-for-cassava-sciences-as-patient-enrollment-lags-for-alzheimers-drug-studies/>
- “What’s Up With Cassava Sciences Flying Today?” *Benzinga*, November 2, 2021, FEINSTEIN_0005173

- “WallStreetBets Reddit Group: What Is It?” *CoinDesk*, January 28, 2021, available at <https://www.coindesk.com/markets/2021/01/28/wallstreetbets-reddit-group-what-is-it/>
- In addition to the public press above, I considered headlines based on a Factiva search for press associated with the Factiva indexing code for “Cassava Sciences, Inc.” during the Proposed Class Period.

SEC Filings

- Cassava Sciences, Inc., Form 4, filed July 20, 2021
- Cassava Sciences, Inc., Form 4, filed March 29, 2022
- Cassava Sciences, Inc., Form 4, filed May 31, 2022
- GameStop Corp., Form 10-K for FY 2020, filed March 23, 2021
- Nokia Corporation, Form 6-K, filed January 27, 2021
- All Cassava Sciences, Inc. Form 8-K filings during the Proposed Class Period

Social Media

- The 100 Reddit posts and 100 tweets with the highest “Reddit Score” and “Impressions”, respectively, on each of the following dates: September 18, 2020; February 3, 2021; February 4, 2021; February 5, 2021; June 11, 2021; July 21, 2021; July 30, 2021; August 30, 2021; September 3, 2021; November 2, 2021; November 10, 2021; November 15, 2021; December 9, 2021; December 17, 2021; December 21, 2021; January 3, 2022; January 4, 2022; March 22, 2022; March 30, 2022; June 1, 2022; September 20, 2022; September 22, 2022

Transcripts

- “Cassava Sciences, Inc. – Q2 2021 Earnings Call,” *FactSet*, August 3, 2021
- “Final Results of a Phase 2b Study of Sumifilam in Alzheimer’s Disease,” *Cassava Sciences*, September 14, 2020
- *Transcripts from conference presentations obtained from FactSet on the following dates: September 14, 2020; September 15, 2020; February 25, 2021; March 9, 2021; April 28, 2021; June 22, 2021; August 3, 2021; September 13, 2021; April 5, 2022; April 27, 2022; September 13, 2022; May 2, 2023; June 8, 2023; September 11, 2023; October 11, 2023*

Websites and Other Online Content

- “*FDA DENIES CITIZEN PETITION ON CASSAVA DRUG \$SAVA,” Twitter, February 10, 2022 10:58 AM ET, available at <https://x.com/zbiotech/status/1491803806140612608>

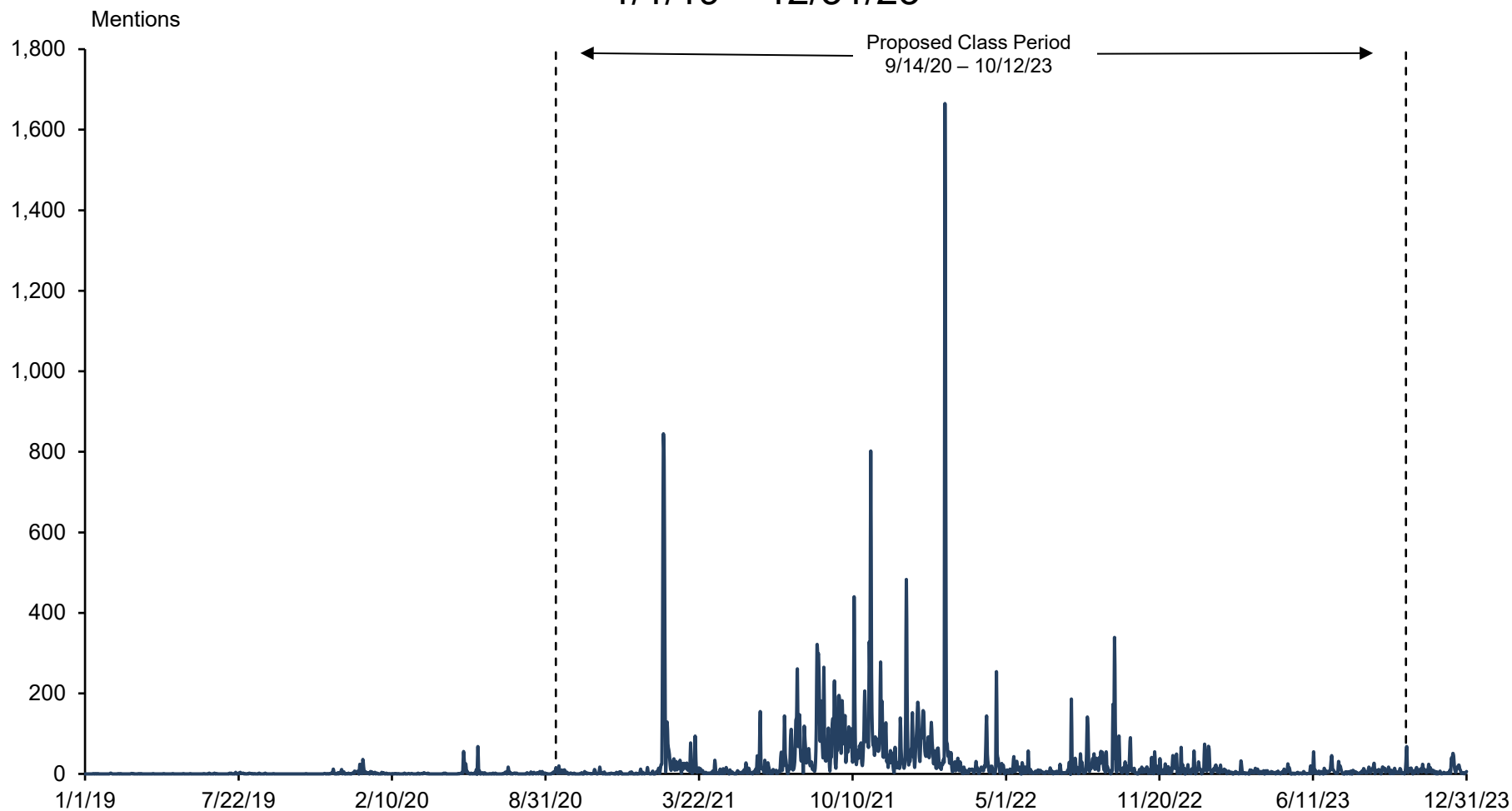
- “\$SAVA | Cassava Corporate presentation - January 2022,” *Twitter*, January 4, 2022, available at <https://x.com/CassavaSciences/status/1478486583670104073?lang=en>
- “\$SAVA SEC Case Closing Recommendation Made. Per SEC Guidelines Case Closing Recommendation is made when ‘no enforcement action will be recommended’ and ‘so resources can be redirected to investigations that will be more productive.’ See SEC enforcement manual,” *Twitter*, September 20, 2022, available at <https://x.com/TCBBIO/status/1572220312653303811>
- “@Ultra_Calls \$SAVA did what holders were hoping \$AMC and \$GME would do. Thanks for this fantastic call. <https://t.co/xlSeR3NK2o>,” *Twitter*, February 3, 2021, available at <http://twitter.com/garyelgringo/statuses/1357080347578613760>
- “Beware: Desperate \$SAVA bulls are circulating a patently forged DOJ letter claiming a an investigation against short sellers. Numerous mistakes starting from my last name and United Dept. of Justice instead of United States. This is a textbook case of market manipulation,” *Twitter*, January 3, 2021, available at <http://twitter.com/QCMFunds/statuses/1478036830251585536>
- “Buying the dip on SAVA 🚀🚀🚀🚀 holding my GME and AMC and NOK not advice. Clue bird,” *Reddit*, February 3, 2021, available at https://www.reddit.com/r/wallstreetbets/comments/lby4jj/what_are_your_moves_tomorrow_february_04_2021/glx23tq/
- “Complete Guide to Measure Metrics,” *Social Media Management*, available at <https://social-media-management-help.brandwatch.com/hc/en-us/articles/4568227788445-Complete-Guide-to-Measure-Metrics>
- “Equity Options Product Specifications,” *CBOE*, Undated, available at https://www.cboe.com/exchange_traded_stock/equity_options_spec/
- “FAQ,” *Reddit*, available at <https://www.reddit.com/wiki/faq/>
- “<https://sciencedirect.com/science/article/pii/S0197458022000562> | New Corrigendum Issued! Journal cops out and issues E.O.C. pending CUNY Coming Soon we hope, we all need a definitive voice. \$SAVA @AD3ENDALZ @ADScience4 @lawrenceshaw82 @MicrobiomDigest @JJSchaible @IBD_AGatlin,” *Twitter*, March 22, 2022, available at <https://x.com/sing3r/status/1506349082448519169>
- “Neuroscience just posted an Editorial Note about a paper by HY Wang at all related to Cassava Sciences \$SAVA The authors provided original, uncropped blots. But as with the J Neuroscience correction, I am not sure if these are indeed original. <https://sciencedirect.com/science/article/pii/S0306452221005789>,” *Twitter*, December 20, 2021, available at <https://x.com/MicrobiomDigest/status/1473083028029140993>
- “Nobel Winner Eugene Fama on GameStop, Market Bubbles and Why Indexing Is King,” *MarketWatch*, March 3, 2021, available at

<https://www.marketwatch.com/story/nobel-winner-eugene-fama-on-bubbles-why-indexing-is-stillking- and-gamestop-11614776294>

- “Roundhill and Solactive Capture Social Media Sentiment with MEME ETF,” *Solactive*, December 8, 2021, available at <https://www.solactive.com/roundhill-and-solactive-capture-social-media-sentiment-with-meme/>
- “There are actually FIVE @PLOSONE retractions of papers from Dr. HY Wang today \$SAVA https://journals.plos.org/plosone/search?filterJournals=PLoSONE&q=retraction&sortOrder=DATE_NEWEST_FIRST&page=1,” *Twitter*, March 30, 2022, available at https://x.com/Adrian_H/status/1509248089898594306
- “There's an image circulating today of a DOJ #FOIA response regarding Cassava Sciences. Someone wants us to believe it's real. We don't think it is. | It's electronic trail should be relatively easy for investigators to follow. Criminal charges could easily result. \$SAVA,” *Twitter*, January 3, 2021, available at <http://twitter.com/probesreporter/statuses/1478065550890835968>
- “We need a piece of news from \$SAVA, like a potential partnership announcement from a bigpharma like \$PFE, to continue a \$CAR like short squeeze, as well as shake off the weak hands & traders. Stay strong & long 🍊.” *Twitter*, November 2, 2021, available at <http://twitter.com/LuoshengPeng/statuses/1455623367306919936>
- “What are communities or ‘subreddits’?,” *Reddit*, available at <https://support.reddithelp.com/hc/en-us/articles/204533569-What-are-communities-or-subreddits>
- “What is Factiva?,” *Dow Jones*, available at <https://www.dowjones.com/professional/glossary/factiva/>

Note: In addition to the documents on this list, I considered all documents cited in my report and my exhibits to form my opinions.

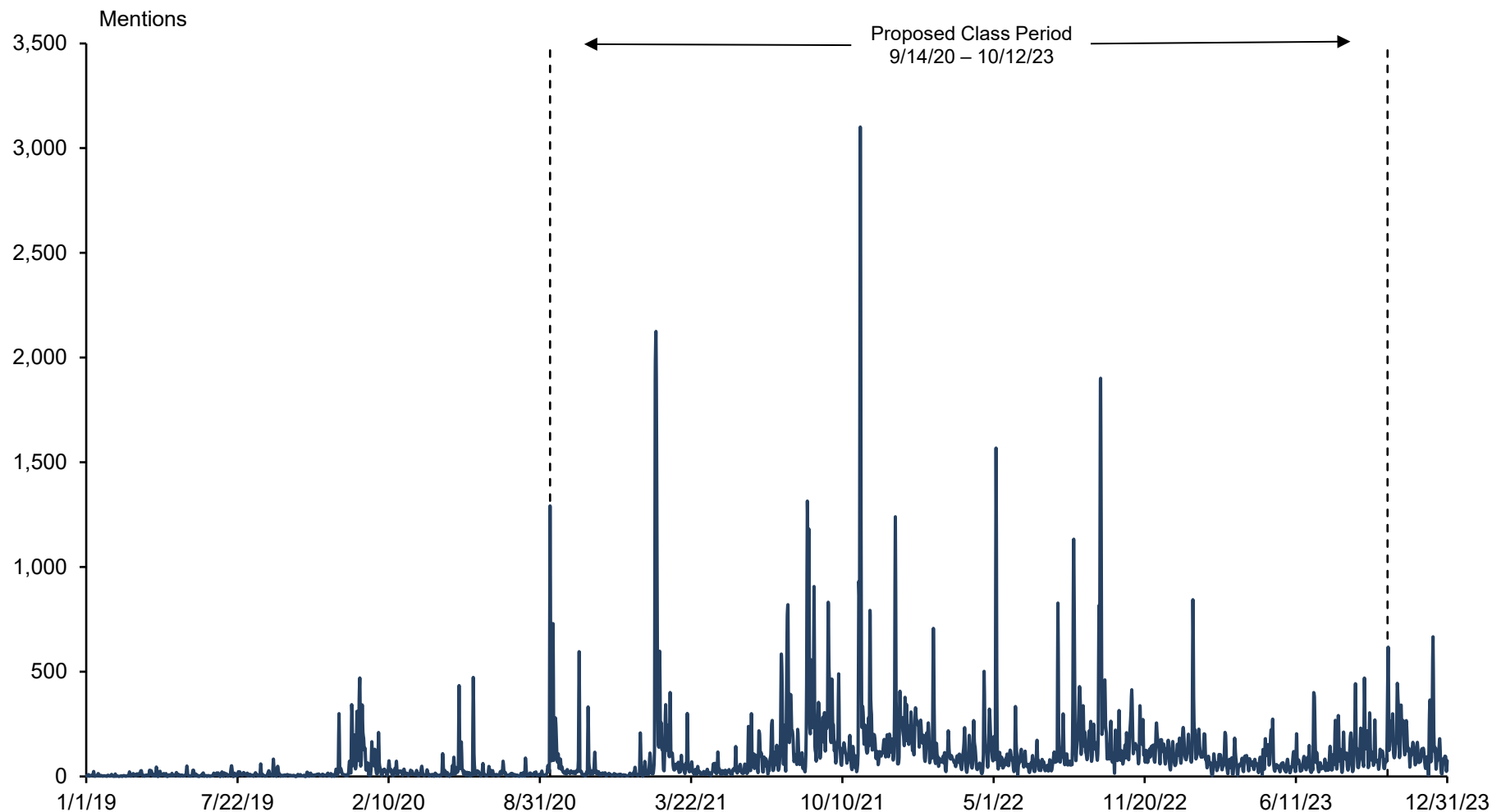
Cassava Sciences, Inc. Daily Reddit Mentions of “SAVA” 1/1/19 – 12/31/23



Source: *Brandwatch*; Supplemented Consolidated Complaint

Note: Daily mentions are the number of Reddit posts on a given day containing a mention of “SAVA” or “SAVA” followed or preceded by special characters on either side, such as “\$SAVA” or “SAVA’s.”

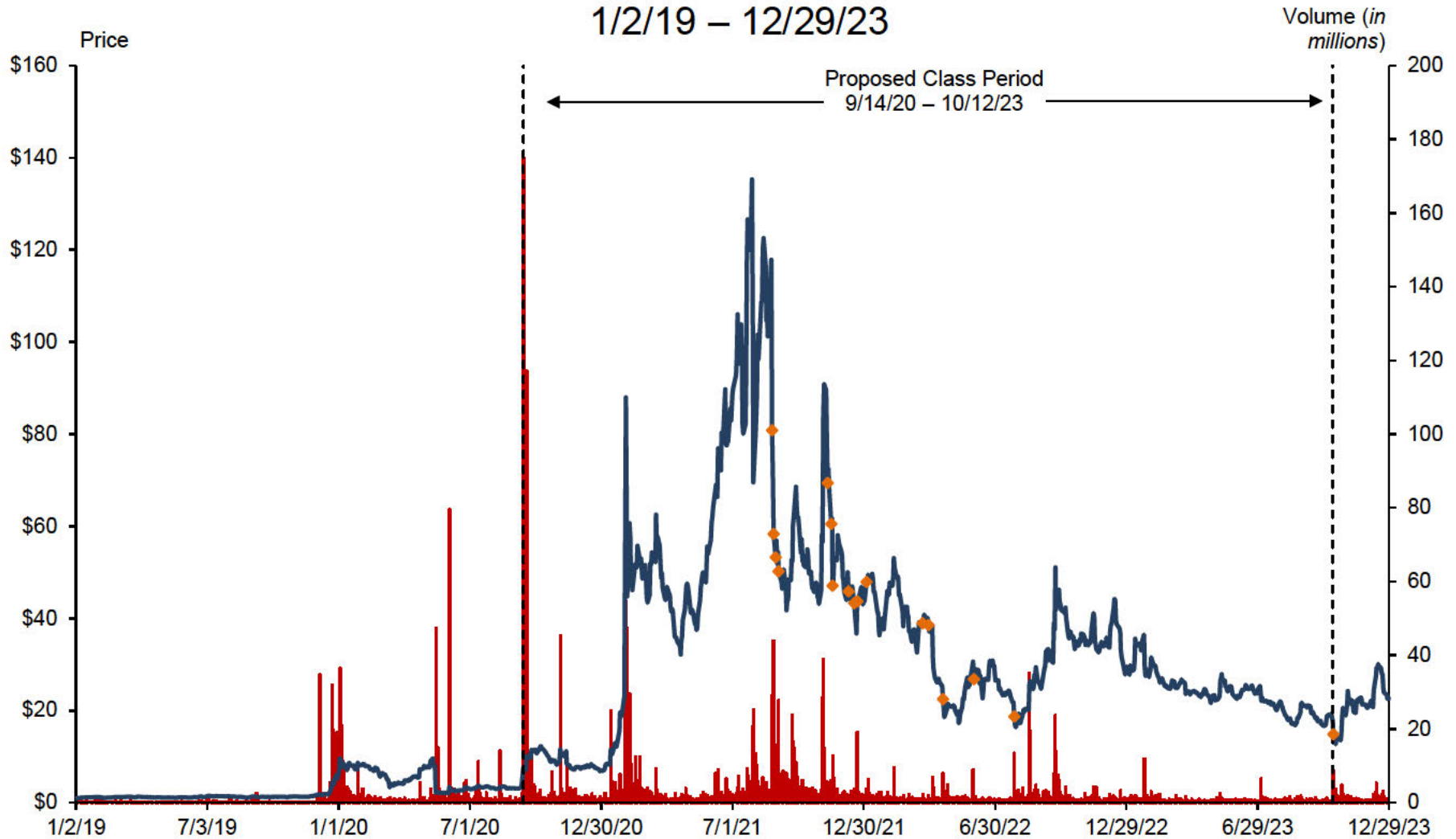
Cassava Sciences, Inc. Daily Twitter Mentions of “SAVA” 1/1/19 – 12/31/23



Source: *Brandwatch*; Supplemented Consolidated Complaint

Note: Daily mentions are the number of Twitter posts on a given day containing a mention of “SAVA” or “SAVA” followed or preceded by special characters on either side, such as “\$SAVA” or “SAVA’s.”

Cassava Sciences, Inc. Closing Stock Price and Volume 1/2/19 – 12/29/23



Source: *Refinitiv*; Supplemented Consolidated Complaint

Note: Diamonds denote impact dates of alleged corrective disclosures discussed in Section I as well as Sections VII–IX of the Supplemented Consolidated Complaint. Plaintiffs allege that the trading day following the impact date of the alleged corrective disclosures on 8/25/21, 12/17/21, 4/18/22, and 10/12/23 showed a continued market response to the allegedly disclosed information.

Cassava Sciences, Inc.
t-Statistic of Coefficient for Goldman Sachs Retail Favorites
Index in Dr. Feinstein's 8-K Event Study Model
9/14/20 – 10/12/23



Source: *Bloomberg*; Feinstein Report

Note: This exhibit shows the results of adding the returns of the Goldman Sachs Retail Favorites Index to Dr. Feinstein's 8-K event study model, in addition to his market and industry indices. In this three-factor regression, the returns of Cassava stock are regressed on those of the CRSP US Total Market Index, the Nasdaq Biotechnology Index, and the Goldman Sachs Retail Favorites Index. All returns are logged, and the returns of the Goldman Sachs Retail Favorites Index are orthogonalized with respect to the market and industry indices. The regression uses a 252-day rolling control period. Dummy variables are used for dates identified by Dr. Feinstein as 8-K news days. t-Statistics that are significant at the 95% confidence level are shown in red.

Cassava Sciences, Inc.
t-Statistic of Coefficient for Solactive Roundhill Meme Stock
Index in Dr. Feinstein's 8-K Event Study Model
9/14/20 – 10/12/23



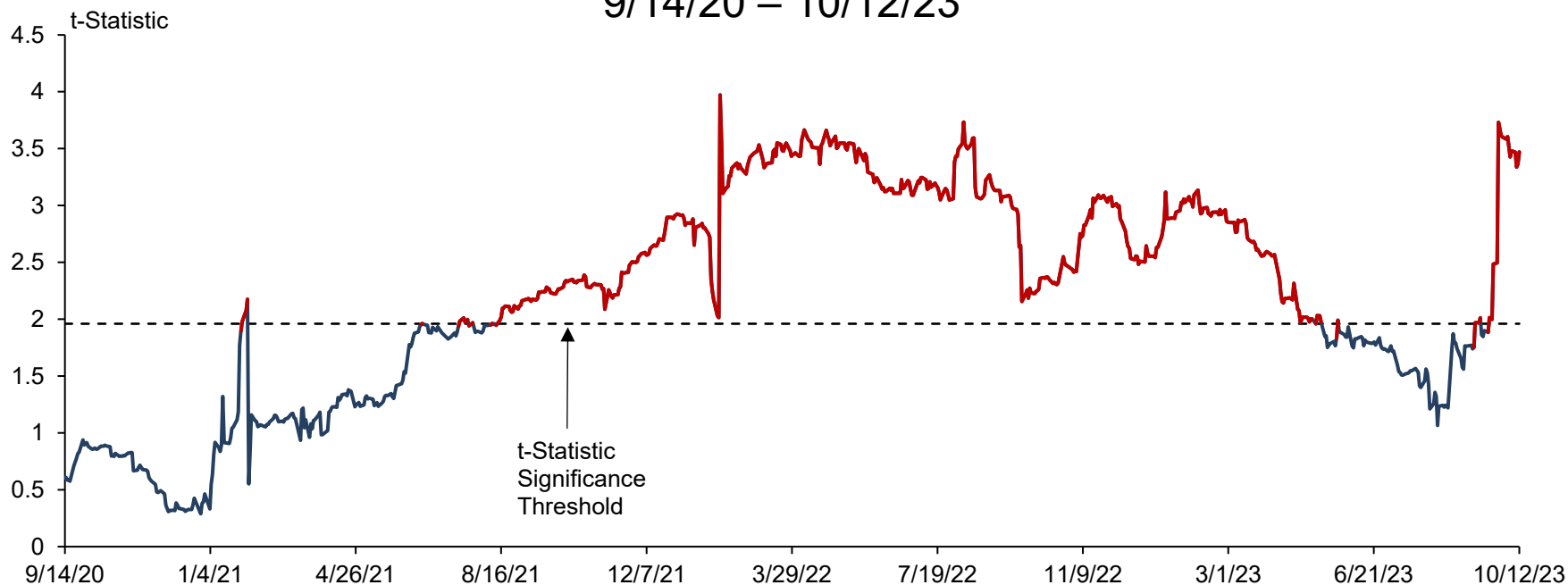
Source: *Bloomberg*; Feinstein Report

Note: This exhibit shows the results of adding the returns of the Solactive Roundhill Meme Stock Index to Dr. Feinstein's 8-K event study model, in addition to his market and industry indices. In this three-factor regression, the returns of Cassava stock are regressed on those of the CRSP US Total Market Index, the Nasdaq Biotechnology Index, and the Solactive Roundhill Meme Stock Index. All returns are logged, and the returns of the Solactive Roundhill Meme Stock Index are orthogonalized with respect to the market and industry indices. The regression uses a 252-day rolling control period. Dummy variables are used for dates identified by Dr. Feinstein as 8-K news days. Because returns for the Solactive Roundhill Meme Stock Index are not available before November 10, 2021, the first coefficient shown is on November 10, 2022. t-Statistics that are significant at the 95% confidence level are shown in red.

Cassava Sciences, Inc.

t-Statistic of Coefficient for Constructed Meme Index in Dr. Feinstein's 8-K Event Study Model

9/14/20 – 10/12/23



Source: Bloomberg; Refinitiv; Feinstein Report

Note: This exhibit shows the results of adding the returns of an equal-weighted index of 24 companies included in the Solactive Roundhill Meme Stock Index as of December 1, 2021 (the "Constructed Meme Index") to Dr. Feinstein's 8-K event study model, in addition to his market and industry indices. In this three-factor regression, the returns of Cassava stock are regressed on those of the CRSP US Total Market Index, the Nasdaq Biotechnology Index, and the Constructed Meme Index. All returns are logged, and the returns of the Constructed Meme Index are orthogonalized with respect to the market and industry indices. The regression uses a 252-day rolling control period. Dummy variables are used for dates identified by Dr. Feinstein as 8-K news days. Cassava was a member of the Solactive Roundhill Meme Stock Index on December 1, 2021, but is not included in the Constructed Meme Index. The 24 companies included in the Constructed Meme Index are: Riot Platforms, Inc.; ZIM Integrated Shipping Services, Ltd.; Marathon Digital Holdings, Inc.; Lucid Group, Inc.; Penn Entertainment, Inc.; Peloton Interactive, Inc.; Cleveland-Cliffs, Inc.; Upstart Holdings, Inc.; Trump Media & Technology Group, Corp.; DraftKings Holdings, Inc.; Virgin Galactic Holdings, Inc.; Beyond Meat, Inc.; Tilray Brands, Inc.; ROBLOX, Corp.; fuboTV, Inc.; Robinhood Markets, Inc.; SoFi Technologies, Inc.; ContextLogic, Inc.; GameStop, Corp.; Clover Health Investments, Corp.; SNDL, Inc.; Rush Street Interactive, Inc.; AMC Entertainment Holdings, Inc.; and Bed Bath & Beyond, Inc. Not all 24 companies have return data available for the full period dating back to September 13, 2019, the beginning of the 252-day control period needed to estimate a coefficient for the first day of the Proposed Class Period. Therefore, on each date, the index return is the equal-weighted average of the returns of the subset of the 24 companies with available return data on that date. t-statistics that are significant at the 95% confidence level are shown in red.

Cassava Sciences, Inc.
Proportion of Statistically Significant Residuals
High Social Media Days vs. All Other “Non- or Lesser-News Days”
9/14/20 – 10/12/23

	Using Residuals from Dr. Feinstein’s 8-K Event Study Model	Using Residuals from Dr. Feinstein’s 8-K without Earnings Announcements Event Study Model	Using Residuals from Dr. Feinstein’s Top Article Count Event Study Model
High Social Media Days	26.5%	26.5%	29.4%
All Other “Non- or Lesser-News Days”	1.7%	1.7%	1.2%
Fisher Exact Test P-Value	<0.0001	<0.0001	<0.0001
Fisher Exact Test Significance	✓	✓	✓

Source: *Brandwatch*; Feinstein Report; Supplemented Consolidated Complaint

Note: Percentages indicate the proportion of days in each of Dr. Feinstein's event study models with residual returns that were statistically significant at the 95% confidence level. I identify “High Social Media Days” by considering days which were identified as “non- or lesser-news days” in all three of Dr. Feinstein's event study models, removing the impact dates of alleged misrepresentations and disclosures of allegedly corrective information discussed in Section I as well as Sections VII–IX of the Supplemented Consolidated Complaint, and identify the 5% of these days with the most social media mentions. Checkmarks indicate that the difference in the proportion of statistically significant residuals between High Social Media Days and All Other “Non- or Lesser-News Days” for a given event study model is statistically significant at the 95% confidence level based on a two-tailed Fisher Exact test.

Cassava Sciences, Inc.
Proportion of Statistically Significant Residuals
High Social Media Days vs. Dr. Feinstein's "News Days"
9/14/20 – 10/12/23

	Using "News Days" and Residuals from Dr. Feinstein's 8-K Event Study Model	Using "News Days" and Residuals from Dr. Feinstein's 8-K without Earnings Announcements Event Study Model	Using "News Days" and Residuals from Dr. Feinstein's Top Article Count Event Study Model
High Social Media Days	26.5%	26.5%	29.4%
Feinstein "News Days"	19.5%	27.6%	34.3%
Fisher Exact Test P-Value	0.58	1.00	0.80
Fisher Exact Test Significance	✗	✗	✗

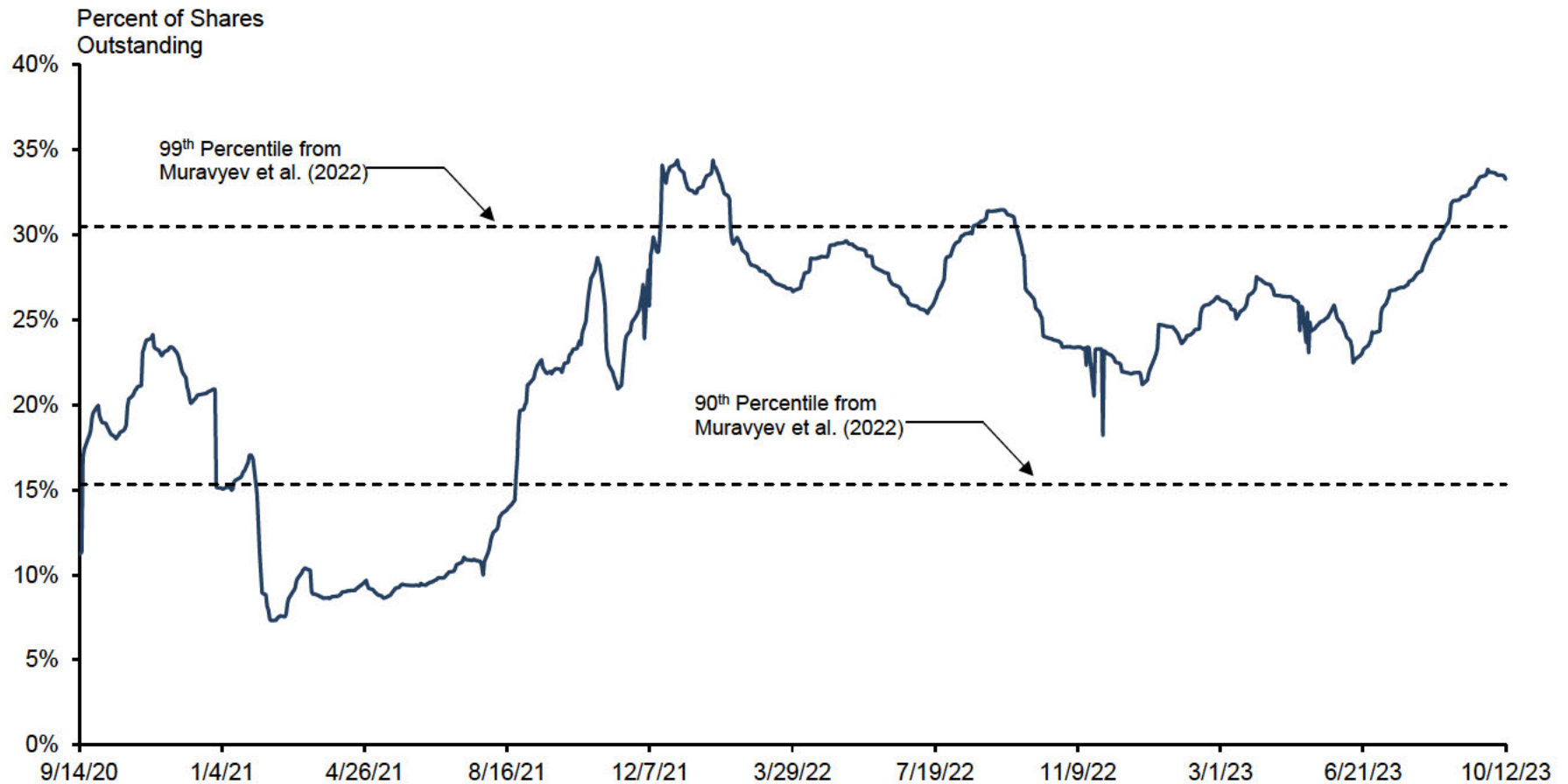
Source: *Brandwatch*; Feinstein Report; Supplemented Consolidated Complaint

Note: Percentages indicate the proportion of days in each of Dr. Feinstein's event study models with residual returns that were statistically significant at the 95% confidence level. I identify "High Social Media Days" by considering days which were identified as "non- or lesser-news days" in all three of Dr. Feinstein's event study models, removing the impact dates of alleged misrepresentations and disclosures of allegedly corrective information discussed in Section I as well as Sections VII–IX of the Supplemented Consolidated Complaint, and identify the 5% of these days with the most social media mentions. Checkmarks indicate that the difference in the proportion of statistically significant residuals between High Social Media Days and Dr. Feinstein's "News Days" for a given event study model is statistically significant at the 95% confidence level based on a two-tailed Fisher Exact test.

Cassava Sciences, Inc.

Short Interest as a Percent of Shares Outstanding

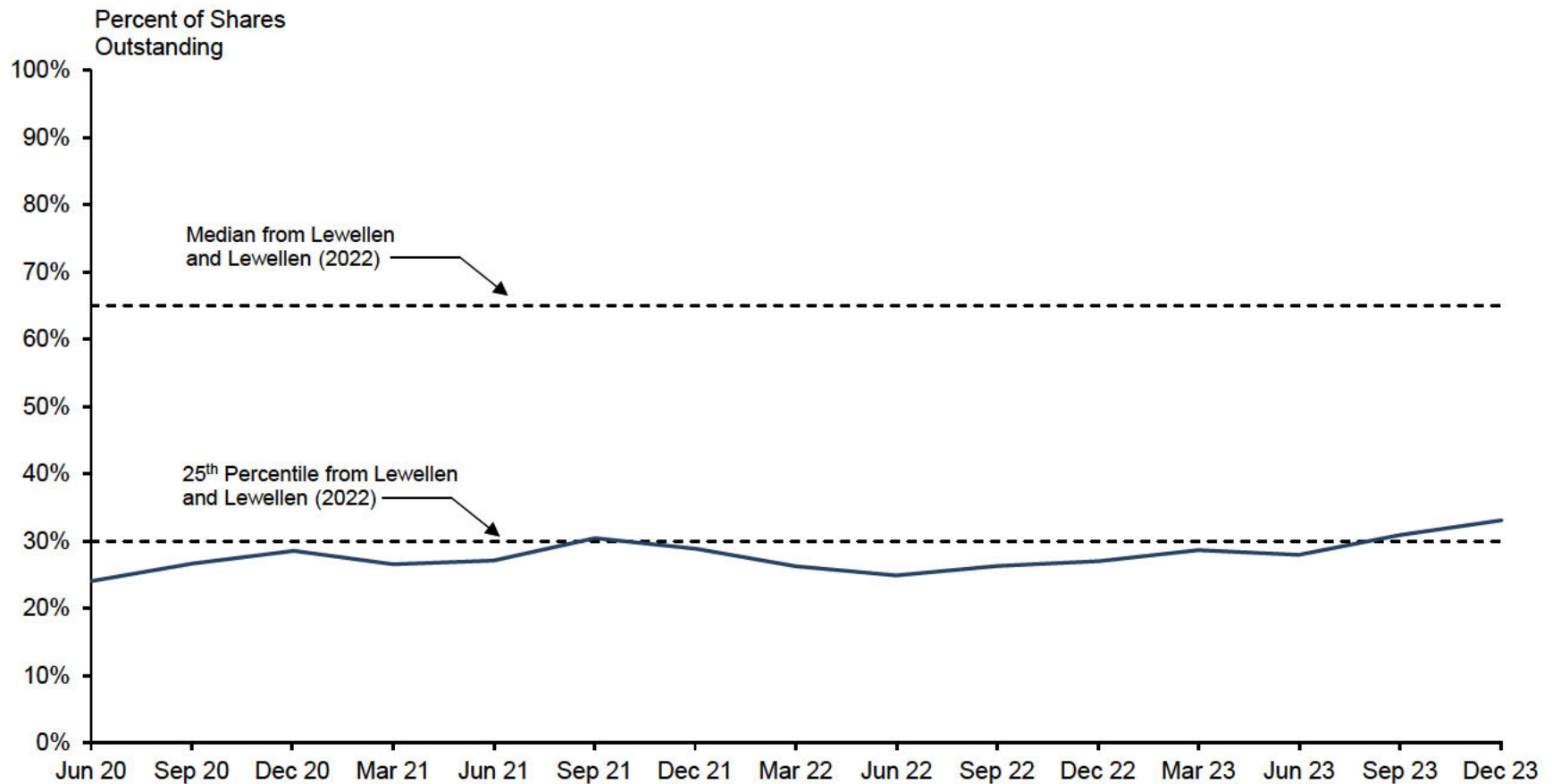
9/14/20 – 10/12/23



Source: CRSP; S3 Partners; Muravyev et al. (2022)

Note: The date of each observation in the data is adjusted by two trading days to reflect the difference between trading date and settlement date. Muravyev et al. (2022) analyze a sample of U.S. equities that had exchange-traded options over the period from July 2006 to August 2015 and find that the 90th percentile of short interest was 15.32%, and the 99th percentile of short interest was 30.49%, reflected in the dotted lines in this chart.

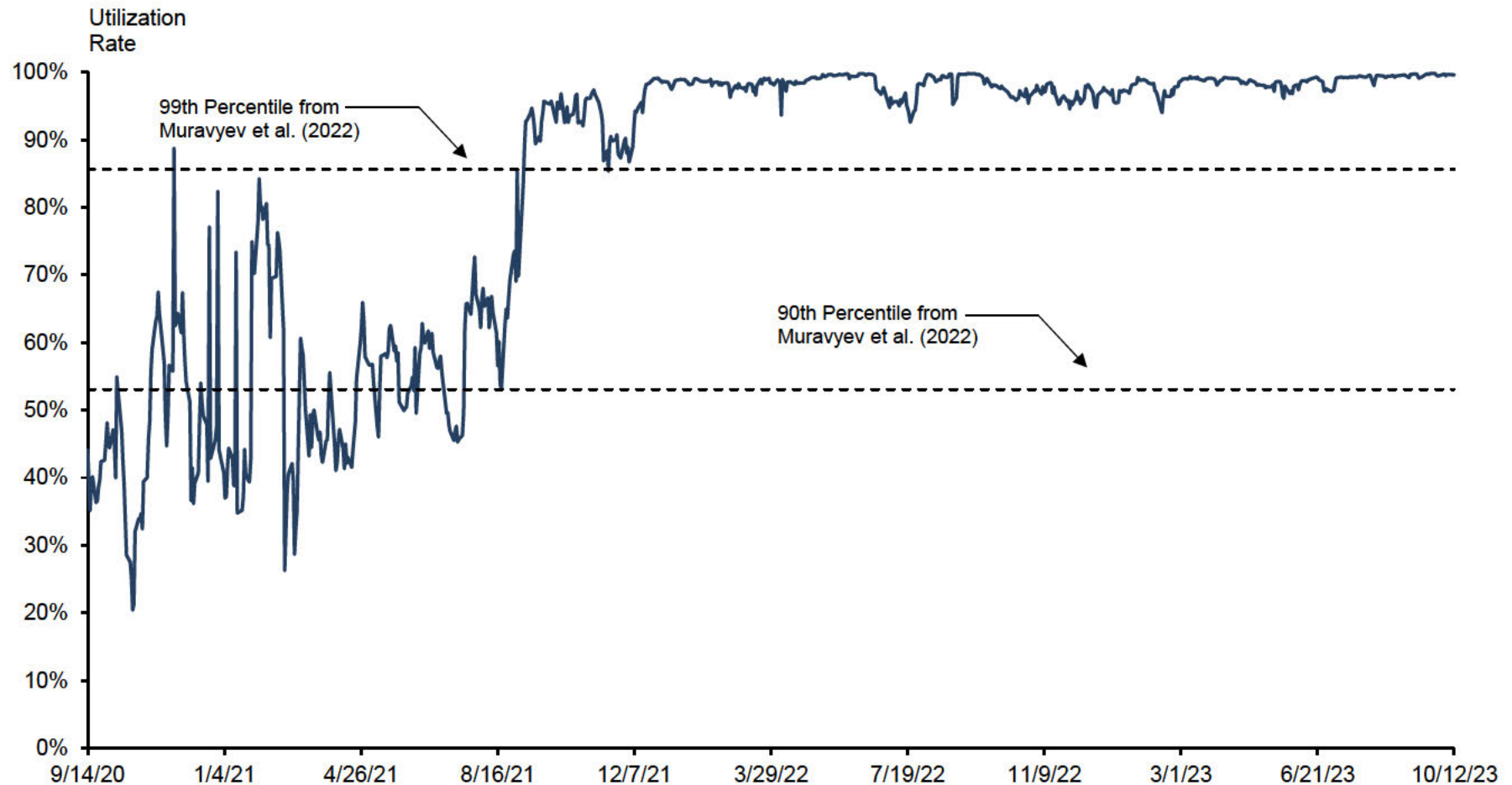
Cassava Sciences, Inc. Institutional Holdings as a Percentage of Shares Outstanding 6/30/20 – 12/31/23



Source: CRSP; Refinitiv; Lewellen and Lewellen (2022)

Note: Institutional holdings data come from SEC Form 13-F filings available through Refinitiv and are compared with shares outstanding on the last trading day of each quarter. Lewellen and Lewellen (2022) analyze a sample of public firms that appear in 13-F filings over the period between 2015 and 2017 and find that the median institutional holdings as a percentage of shares outstanding was 65%, and the 25th percentile of institutional holdings as a percentage of shares outstanding was 30%, reflected in the dotted lines in this chart.

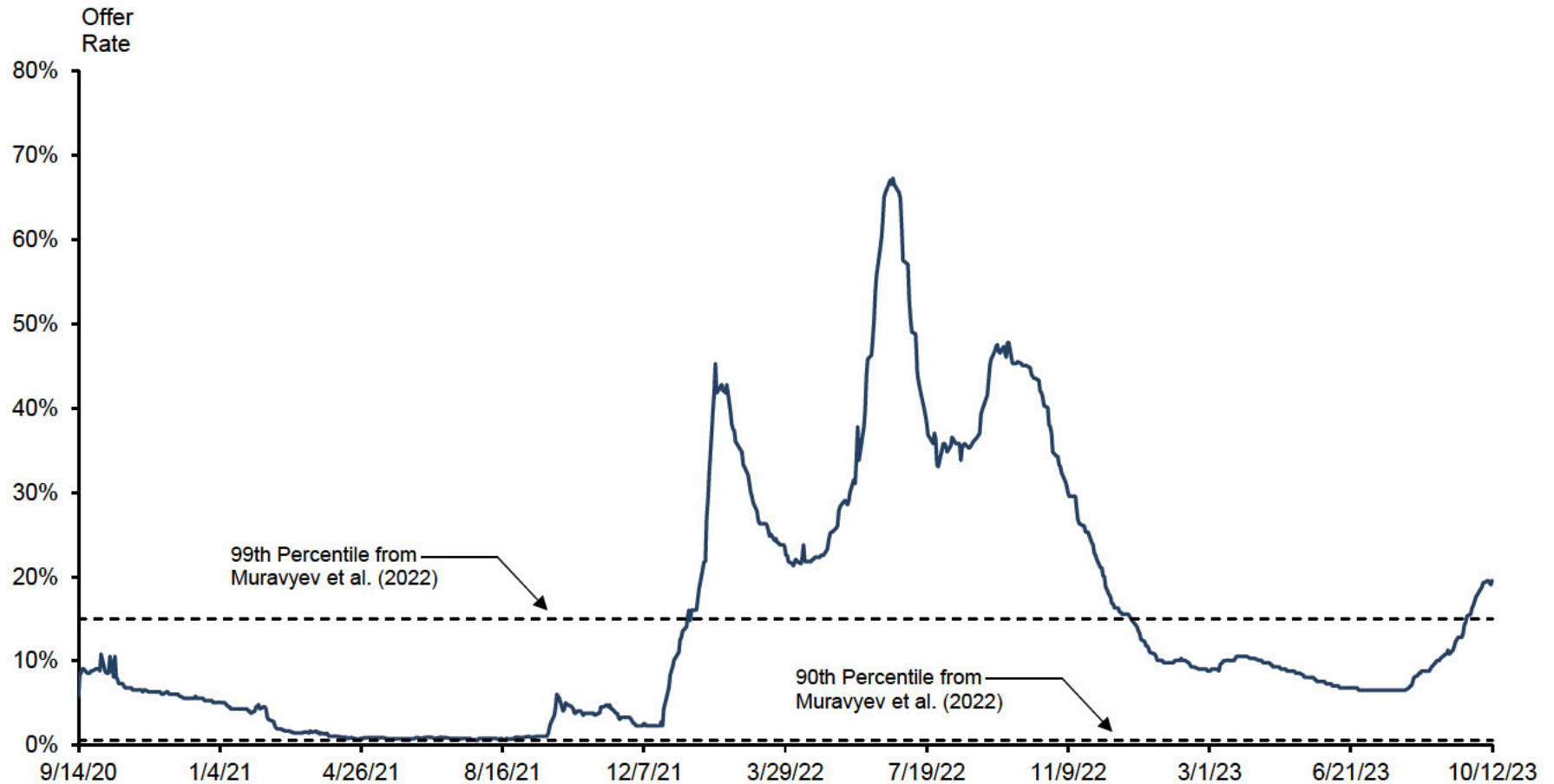
Cassava Sciences, Inc. Short Interest Utilization 9/14/20 – 10/12/23



Source: S3 Partners; Muravyev et al. (2022)

Note: The "Utilization" variable from S3 Partners reflects the short interest divided by the "Total Lendable quantity". The date of each observation in the data is adjusted by two trading days to reflect the difference between trading date and settlement date. Muravyev et al. (2022) analyze a sample of U.S. equities that had exchange-traded options over the period from July 2006 to August 2015 and find that the 90th percentile of utilization was 53.09%, and the 99th percentile of utilization was 85.58%, reflected in the dotted lines in this chart.

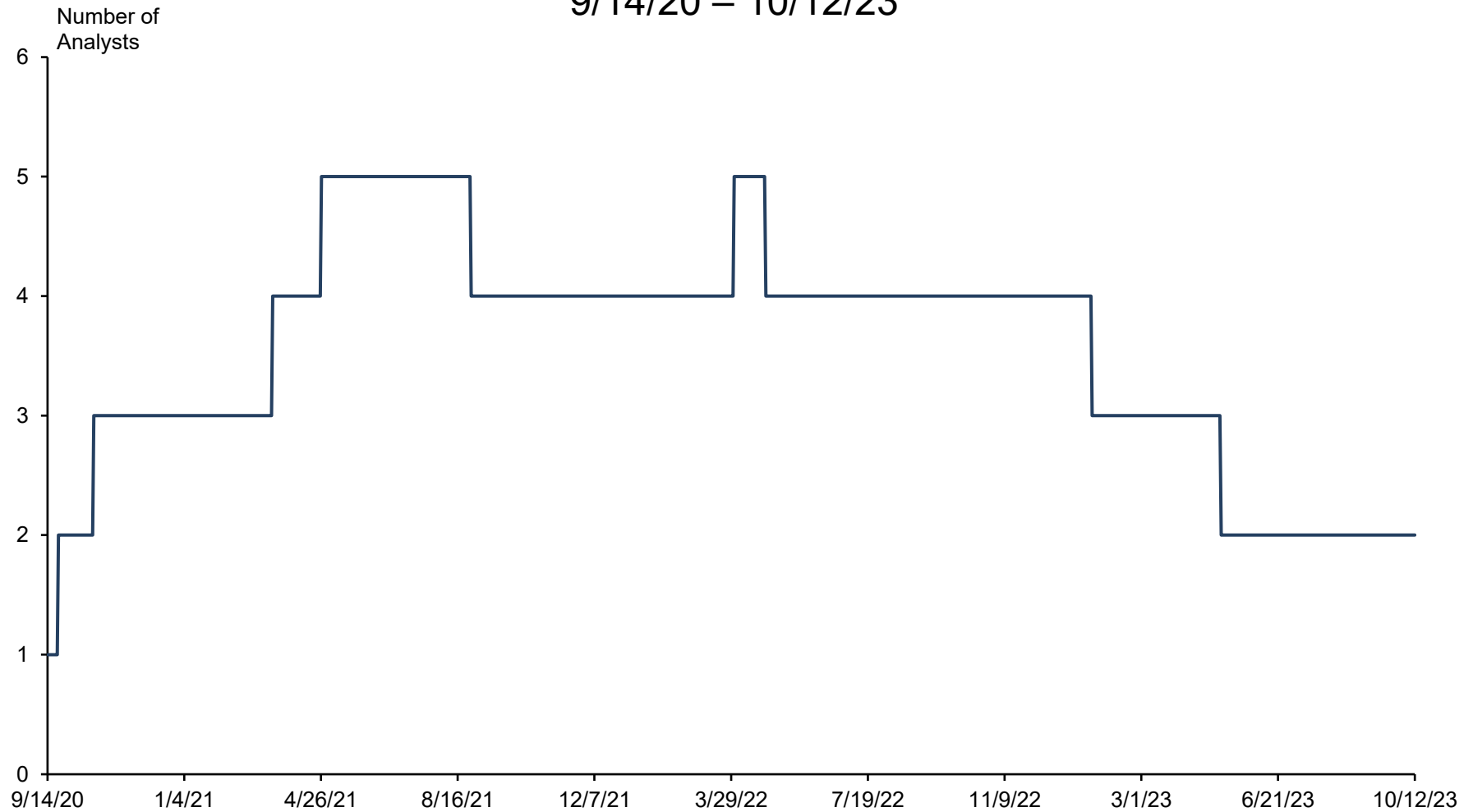
Cassava Sciences, Inc. **Offer Rate** 9/14/20 – 10/12/23



Source: S3 Partners; Muravyev et al. (2022)

Note: The "Offer Rate" variable from S3 Partners reflects the weighted-average borrowing rate paid by short sellers for all existing short positions and reflects the cost of borrowing. Rates presented are annualized rates as in the S3 data. The date of each observation in the data is adjusted by two trading days to reflect the difference between trading date and settlement date. Muravyev et al. (2022) analyze a sample of U.S. equities that had exchange-traded options over the period from July 2006 to August 2015 and find that the 90th percentile of borrowing costs was 0.63%, and the 99th percentile of borrowing costs was 15%, reflected in the dotted lines in this chart.

Cassava Sciences, Inc.
Number of Analysts Publishing a Price Target
9/14/20 – 10/12/23



Source: I/B/E/S via *Refinitiv*

Note: Each analyst is counted over the date range their price targets are active as reflected in *Refinitiv*.

Cassava Sciences, Inc.
Proportion of Statistically Significant Synthetic Stock Residuals
High Social Media Days vs. All Other “Non- or Lesser-News Days”
9/14/20 – 10/12/23

	Using Residuals from Dr. Feinstein’s 8-K Event Study Model	Using Residuals from Dr. Feinstein’s 8-K without Earnings Announcements Event Study Model	Using Residuals from Dr. Feinstein’s Top Article Count Event Study Model
High Social Media Days	26.5%	26.5%	32.4%
All Other “Non- or Lesser-News Days”	1.8%	2.0%	1.7%
Fisher Exact Test P-Value	<0.0001	<0.0001	<0.0001
Fisher Exact Test Significance	✓	✓	✓

Source: *Brandwatch*; Feinstein Report; Supplemented Consolidated Complaint

Note: Percentages indicate the proportion of days in each of Dr. Feinstein’s “synthetic stock” event study models with residual returns that were statistically significant at the 95% confidence level. I identify “High Social Media Days” by considering days which were identified as “non- or lesser-news days” in all three of Dr. Feinstein’s event study models, removing the impact dates of alleged misrepresentations and disclosures of allegedly corrective information discussed in Section I as well as Sections VII–IX of the Supplemented Consolidated Complaint, and identify the 5% of these days with the most social media mentions. Checkmarks indicate that the difference in the proportion of statistically significant residuals between High Social Media Days and All Other “Non- or Lesser-News Days” for a given event study model is statistically significant at the 95% confidence level based on a two-tailed Fisher Exact test.

Cassava Sciences, Inc.
Proportion of Statistically Significant Synthetic Stock Residuals
High Social Media Days vs. Dr. Feinstein's "News Days"
9/14/20 – 10/12/23

	Using "News Days" and Residuals from Dr. Feinstein's 8-K Event Study Model	Using "News Days" and Residuals from Dr. Feinstein's 8-K without Earnings Announcements Event Study Model	Using "News Days" from Dr. Feinstein's Top Article Count Event Study Model
High Social Media Days	26.5%	26.5%	32.4%
Feinstein "News Days"	22.0%	31.0%	31.4%
Fisher Exact Test P-Value	0.79	0.78	1.00
Fisher Exact Test Significance	×	×	×

Source: *Brandwatch*; Feinstein Report; Supplemented Consolidated Complaint

Note: Percentage indicate the proportion of days in each of Dr. Feinstein's "synthetic stock" event study models with residual returns that were statistically significant at the 95% confidence level. I identify "High Social Media Days" by considering days which were identified as "non- or lesser-news days" in all three of Dr. Feinstein's event study models, removing the impact dates of alleged misrepresentations and disclosures of allegedly corrective information discussed in Section I as well as Sections VII–IX of the Supplemented Consolidated Complaint, and identify the 5% of these days with the most social media mentions. Checkmarks indicate that the difference in the proportion of statistically significant residuals between High Social Media Days and Dr. Feinstein's "News Days" for a given event study model is statistically significant at the 95% confidence level based on a two-tailed Fisher Exact test.

Cassava Sciences Inc.
Option Trading Volume on Days with Statistically Significant Returns in
Dr. Feinstein's 8-K Event Study Model^[1]

Date	Stock Return ^[2]	Options Available for Trading ^[3]		Options without Trading Volume		Percent of Options without Trading Volume	
		[A]		[B]		[C] = [B] / [A]	
		Calls	Puts	Calls	Puts	Calls	Puts
9/14/20	133.43%*	23	23	1	5	4%	22%
9/18/20	42.03%*	43	43	2	12	5%	28%
11/13/20	-25.13%*	54	54	7	34	13%	63%
1/13/21	39.98%*	48	48	2	24	4%	50%
1/19/21	22.71%*	50	50	6	33	12%	66%
1/25/21	21.83%*	60	60	5	37	8%	62%
1/26/21	23.92%*	60	60	10	31	17%	52%
2/2/21	141.15%*	126	126	38	47	30%	37%
2/3/21	58.64%*	162	162	18	44	11%	27%
2/4/21	-27.88%*	192	192	18	49	9%	26%
2/5/21	-29.37%*	210	210	38	87	18%	41%
2/8/21	35.42%*	210	210	39	93	19%	44%
7/21/21	29.47%*	194	194	39	72	20%	37%
7/29/21	-23.61%*	244	244	37	88	15%	36%
7/30/21	-32.72%*	244	244	25	96	10%	39%
8/25/21	-31.38%*	570	570	77	262	14%	46%
8/27/21	-17.66%*	769	769	104	322	14%	42%
11/2/21	25.94%*	393	393	64	140	16%	36%
11/4/21	48.96%*	544	544	149	204	27%	38%
11/17/21	-23.70%*	535	535	108	270	20%	50%
4/5/22	-18.82%*	351	351	87	181	25%	52%
4/19/22	-11.26%*	420	420	170	211	40%	50%
5/31/22	14.78%*	308	308	139	156	45%	51%
7/27/22	-13.95%*	334	334	89	159	27%	48%
8/17/22	27.26%*	383	383	136	171	36%	45%
9/6/22	14.91%*	393	393	181	233	46%	59%
9/20/22	28.42%*	407	407	156	194	38%	48%
9/22/22	35.65%*	542	542	181	162	33%	30%
9/23/22	-18.00%*	689	689	320	323	46%	47%
11/16/22	-13.04%*	413	413	221	250	54%	61%
1/11/23	13.92%*	326	326	146	158	45%	48%
1/24/23	-19.21%*	371	371	105	181	28%	49%
5/9/23	14.97%*	294	294	143	198	49%	67%
7/5/23	-12.95%*	274	274	112	152	41%	55%
10/3/23	4.40%*	339	339	239	281	71%	83%
10/4/23	7.41%*	342	342	211	274	62%	80%
Average		303	303	95	145	27%	48%

Source: CRSP; Feinstein Report; Supplemented Consolidated Complaint

Note:

[1] Dates with a statistically significant residual return at the 95% confidence level based on Dr. Feinstein's 8-K event study model are included.

[2] Returns shown are raw returns for Cassava stock reported in CRSP. Returns flagged with "*" are associated with statistically significant residual returns at the 95% confidence level in Dr. Feinstein's 8-K event study model.

[3] An option is considered available to be traded if it has an end-of-day observation in Dr. Feinstein's OptionMetrics data contained in FEINSTEIN_0006835.XLSX.

Cassava Sciences, Inc. Option Trading Volume on Dr. Feinstein's 8K News Days^[1]

Date	Stock Return ^[2]	Options Available for Trading ^[3] [A]		Options without Trading Volume [B]		Percent of Options without Trading Volume [C] = [B] / [A]	
		Calls	Puts	Calls	Puts	Calls	Puts
9/14/20	133.43% *	23	23	1	5	4%	22%
11/4/20	25.57%	54	54	13	34	24%	63%
11/9/20	-5.05%	54	54	24	45	44%	83%
11/13/20	-25.13% *	54	54	7	34	13%	63%
12/14/20	-4.43%	51	51	29	45	57%	88%
1/4/21	3.96%	48	48	22	45	46%	94%
2/8/21	35.42% *	210	210	39	93	19%	44%
2/10/21	-14.37%	210	210	65	121	31%	58%
2/16/21	12.38%	210	210	62	129	30%	61%
3/9/21	15.62%	190	190	94	138	49%	73%
3/23/21	-6.13%	168	168	90	128	54%	76%
4/21/21	8.46%	165	165	86	139	52%	84%
5/7/21	-0.86%	167	167	103	150	62%	90%
6/14/21	-1.57%	178	178	72	122	40%	69%
6/22/21	-13.48%	175	175	64	88	37%	50%
7/29/21	-23.61% *	244	244	37	88	15%	36%
8/3/21	6.10%	244	244	66	158	27%	65%
11/10/21	-11.49%	512	512	196	282	38%	55%
1/7/22	-2.32%	489	489	237	313	48%	64%
3/1/22	-5.50%	392	392	234	264	60%	67%
4/26/22	4.56%	464	464	247	310	53%	67%
5/5/22	-1.71%	439	439	334	319	76%	73%
5/10/22	4.49%	360	360	222	245	62%	68%
8/3/22	-4.54%	425	425	290	339	68%	80%
9/23/22	-18.00% *	689	689	320	323	46%	47%
10/27/22	-2.03%	481	481	342	370	71%	77%
11/3/22	-4.23%	444	444	248	310	56%	70%
11/7/22	-3.29%	387	387	218	255	56%	66%
11/18/22	-3.56%	434	434	207	255	48%	59%
11/22/22	0.89%	390	390	222	283	57%	73%
12/23/22	-4.72%	217	217	129	144	59%	66%
1/24/23	-19.21% *	371	371	105	181	28%	49%
2/28/23	-0.32%	301	301	208	224	69%	74%
3/10/23	0.44%	309	309	210	191	68%	62%
3/17/23	-1.53%	292	292	215	217	74%	74%
5/1/23	0.52%	294	294	201	227	68%	77%
5/2/23	-4.97%	294	294	211	229	72%	78%
5/9/23	14.97% *	294	294	143	198	49%	67%
7/5/23	-12.95% *	274	274	112	152	41%	55%
8/3/23	-0.67%	285	285	213	249	75%	87%
9/14/23	0.77%	301	301	213	249	71%	83%
Average		283	283	150	188	49%	67%

Source: CRSP; Feinstein Report; Supplemented Consolidated Complaint

Note:

[1] Dates that are identified as 8-K news days by Dr. Feinstein are included.

[2] Returns shown are raw returns for Cassava stock reported in CRSP. Returns flagged with "*" are associated with statistically significant residual returns at the 95% confidence level in Dr. Feinstein's 8-K event study model.

[3] An option is considered available to be traded if it has an end-of-day observation in Dr. Feinstein's OptionMetrics data contained in FEINSTEIN_0006835.XLSX.

Cassava Sciences, Inc.
Average Bid-Ask Spread Percentage by Option Series^[1]
9/14/20 – 10/12/23

	Min	Mean	Max	10%	25%	50%	75%	90%
Call								
In-the-Money ^[2]	1%	21%	163%	8%	11%	16%	26%	37%
Out-of-the-Money ^[3]	1%	65%	199%	18%	31%	55%	89%	127%
Total	1%	48%	199%	11%	17%	32%	70%	112%
Put								
In-the-Money ^[2]	2%	18%	190%	6%	8%	13%	22%	34%
Out-of-the-Money ^[3]	2%	63%	198%	11%	23%	50%	93%	141%
Total	2%	42%	198%	7%	11%	22%	57%	116%

Source: Feinstein Report

Note:

[1] For each option series, the start of the analysis period is the earliest day during the Proposed Class Period for which there is an end-of-day observation in Dr. Feinstein's OptionMetrics data contained in FEINSTEIN0006835.xlsx, and the end of the analysis period is the earlier of the option expiration date and 10/12/23. Bid-ask spread is calculated as the difference between the ask and bid prices divided by the mid price.

[2] For option series that alternate between in- and out-of-the-money, summary statistics are calculated based on the days the option series is in-the-money. At-the-money options are grouped with in-the-money options.

[3] For option series that alternate between in- and out-of-the-money, summary statistics are calculated based on the days the option series is out-of-the-money. At-the-money options are grouped with in-the-money options.

Cassava Sciences, Inc.
Percent of Days with No Trading by Option Series^[1]
9/14/20 – 10/12/23

	Min	Mean	Max	10%	25%	50%	75%	90%
Call								
In-the-Money ^[2]	0%	61%	100%	0%	30%	71%	100%	100%
Out-of-the-Money ^[3]	0%	39%	100%	0%	8%	33%	67%	89%
Total	0%	57%	100%	8%	29%	60%	90%	100%
Put								
In-the-Money ^[2]	0%	67%	100%	0%	47%	78%	100%	100%
Out-of-the-Money ^[3]	0%	46%	100%	0%	13%	43%	78%	100%
Total	0%	64%	100%	15%	39%	71%	96%	100%

Source: Feinstein Report

Note:

[1] For each option series, the start of the analysis period is the earliest day during the Proposed Class Period for which there is an end-of-day observation in Dr. Feinstein's OptionMetrics data contained in FEINSTEIN0006835.xlsx, and the end of the analysis period is the earlier of the option expiration date and 10/12/23. An option series is considered to have no trading for a given day if the "volume" variable is equal to zero in Dr. Feinstein's OptionMetrics data.

[2] For option series that alternate between in- and out-of-the-money, summary statistics are calculated based on the days the option series is in-the-money. At-the-money options are grouped with in-the-money options.

[3] For option series that alternate between in- and out-of-the-money, summary statistics are calculated based on the days the option series is out-of-the-money. At-the-money options are grouped with in-the-money options.

Cassava Sciences, Inc.

Summary Statistics for Options

9/14/20 – 10/12/23

Number of Options Series ^[1]	15,016
Unique Strike Price-Expiration Combinations ^[2]	7,508
Number of Unique Strike Prices	212
Options Strike Price Range	\$0.5 – \$210.00
Cassava Stock Price Range	\$6.79 – \$135.30
Number of Unique Expiration Dates	137
Options Expiration Date Range	9/18/20 – 1/16/26

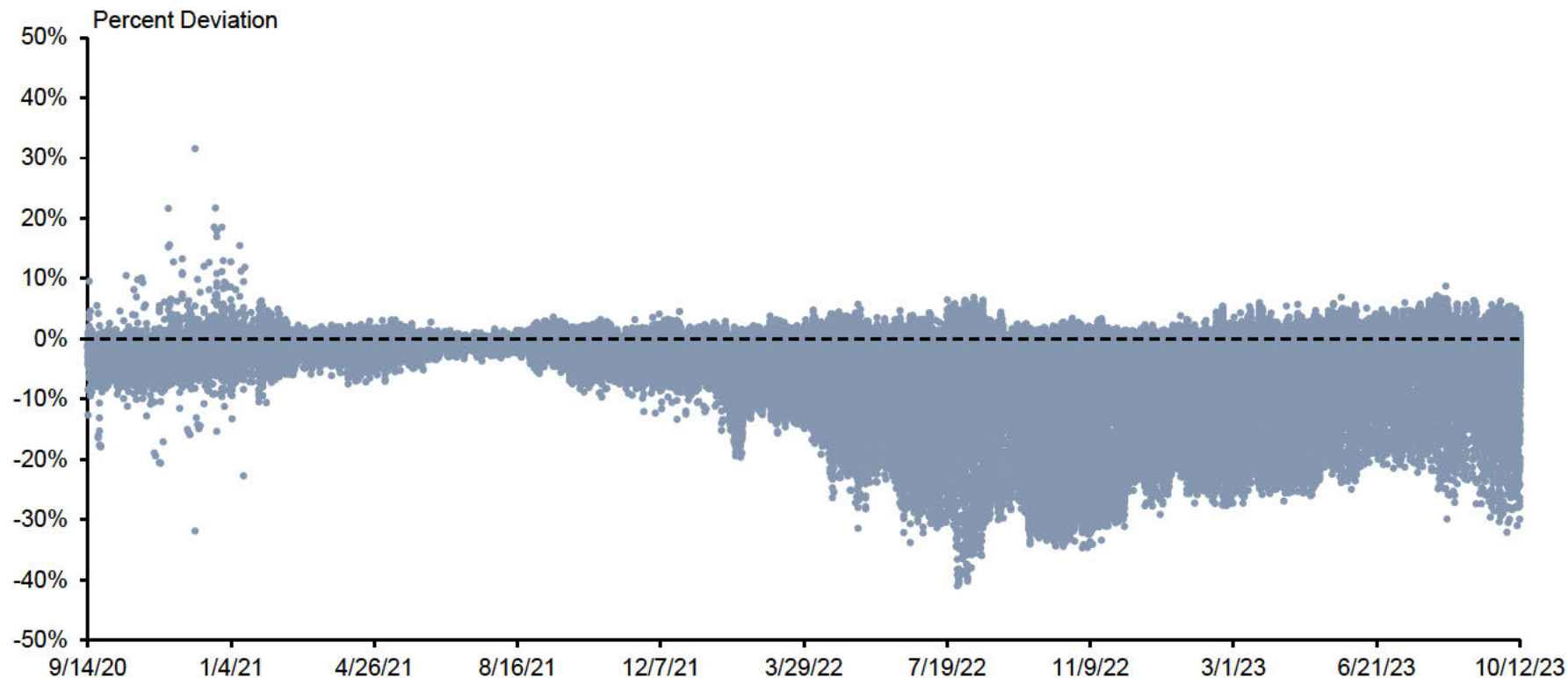
Source: Feinstein Report

Note:

[1] Call and put options with the same strike price and expiration are counted separately.

[2] Call and put options with the same strike price and expiration are counted together.

Cassava Sciences, Inc.
Deviation of Individual Option Synthetic Prices from
Actual Stock Price
9/14/20 – 10/12/23

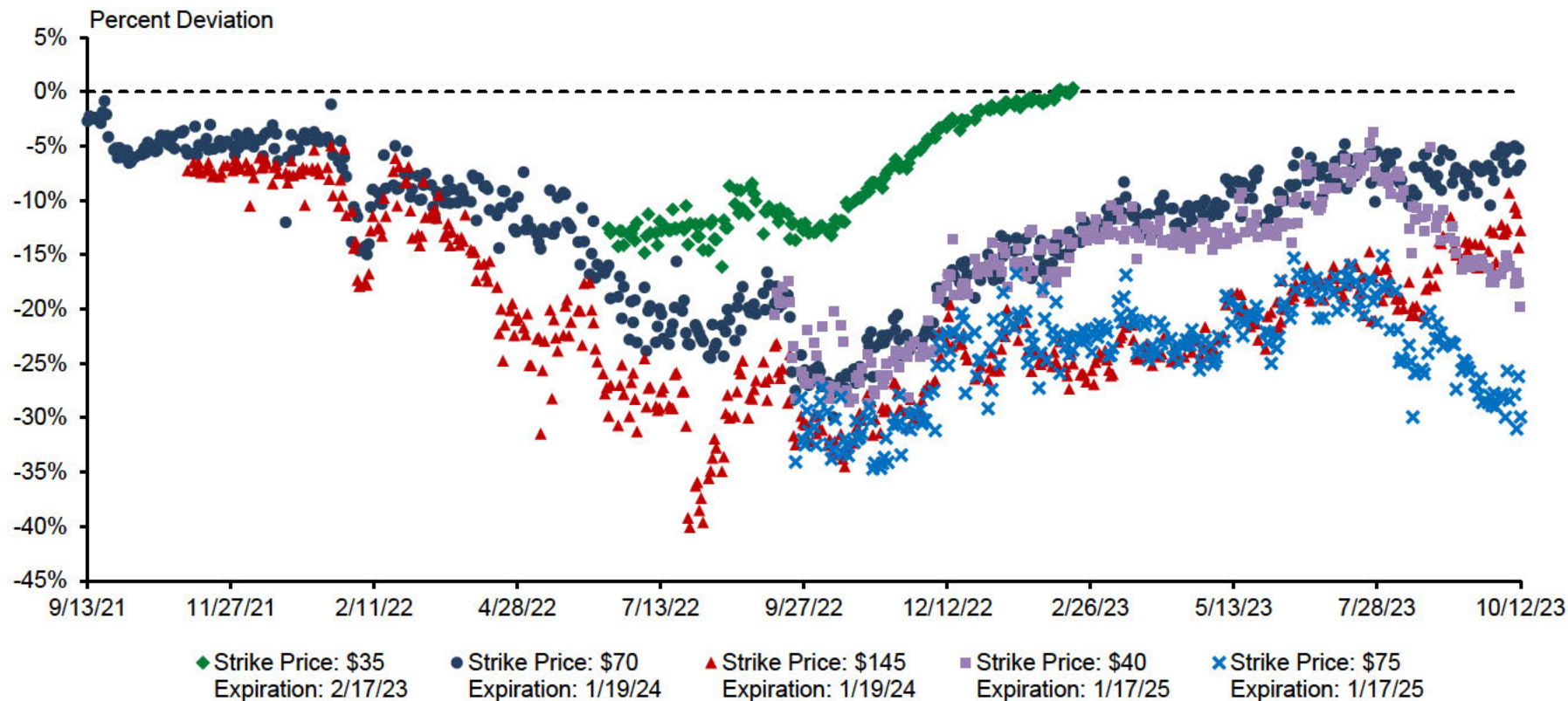


Source: Feinstein Report

Note: Percent deviation from actual stock price is calculated using the synthetic stock prices Dr. Feinstein calculates for each put-call option pair in his backup materials. Percent deviation is then calculated as $(\text{Synthetic Price} - \text{Actual Price}) / \text{Actual Price}$. Each observation represents an individual put-call option pair on each day. Dr. Feinstein calculates the synthetic stock price as the average of the synthetic bid and synthetic ask stock prices. For each pair of options, he calculates the synthetic bid price as the call bid price less the put ask price plus the discounted strike price using the "Broker-Call Money Rate Index" rate, and he calculates the synthetic ask price as the call ask price less the put bid price plus the discounted strike price using the risk-free rate. See Feinstein Report, ¶¶ 198–200.

Cassava Sciences, Inc.

Deviation of Individual Option Synthetic Prices from Actual Stock Price for Example Option Pairs^[1] 9/13/21 – 10/12/23



Source: Feinstein Report

Note: Percent deviation from actual stock price is calculated using the synthetic stock prices Dr. Feinstein calculates in his backup materials. Percent deviation is then calculated as $(\text{Synthetic Price} - \text{Actual Price}) / \text{Actual Price}$. Each observation represents an individual put-call option pair on each day. Dr. Feinstein calculates the synthetic stock price as the average of the synthetic bid and synthetic ask stock prices. For each pair of options, he calculates the synthetic bid price as the call bid price less the put ask price plus the discounted strike price using the "Broker-Call Money Rate Index" rate, and he calculates the synthetic ask price as the call ask price less the put bid price plus the discounted strike price using the risk-free rate. See Feinstein Report, ¶¶ 198–200.

Cassava Sciences, Inc.
Residual Return on Alleged Corrective Disclosure Impact Dates

Event Date	Impact Date ^[1]	Residual 8-K Event Study Model ^[2]	Residual 8-K without Earnings Announcements Event Study Model ^[2]	Residual Top Article Count Event Study Model ^[2]	In Feinstein Summary of Allegations? ^[3]	Alleged Corrective Event
8/25/21	8/25/21	-39.52%*	-39.52%*	-38.97%*	✓	Citizen Petition posted after hours the previous day, and Cassava issued a public statement in response.
8/26/21 ^[4]	8/26/21	-12.78%	-12.76%	-12.87%		Continued response to Citizen Petition.
8/27/21	8/27/21	-21.86%*	-21.81%*	-20.90%*	✓	Quanterix issued a statement that it did not interpret the test results Cassava presented or prepare the data, which Cassava confirmed.
8/30/21	8/30/21	-9.97%	-9.93%	-9.61%	✓	A supplement to the Citizen Petition was filed.
9/3/21	9/3/21	-8.49%	-8.47%	-8.33%	✓	Cassava issued press release "Cassava Sciences Releases a Public Statement Regarding Recent Allegations" with a transcript of Mr. Barbier's remarks.
11/10/21	11/10/21	-10.05%	-10.00%	-10.68%		<i>Journal of Neuroscience</i> published an Erratum, releasing study data. Dr. Bik raised concerns on Twitter and PubPeer about the data.
11/15/21	11/15/21	-13.18%	-13.12%	-12.92%	✓	Cassava filed its Q3 2021 Form 10-Q, disclosing that government agencies had asked for information and documents.
11/17/21	11/17/21	-26.78%*	-26.71%*	-27.02%*	✓	The <i>Wall Street Journal</i> published an article discussing investigations by the SEC and NIH into Cassava. A third supplement was added to the Citizen Petition.
12/9/21	12/9/21	-5.52%	-5.31%	-5.73%		A fourth supplement to the Citizen Petition was filed.
12/17/21	12/17/21	-2.20%	-2.26%	-3.43%		<i>The Journal of Neuroscience</i> changed its "Editorial Note" to an Expression of Concern.
12/20/21 ^[4]	12/20/21	-13.84%	-13.69%	-14.54%		Continued response to <i>Journal of Neuroscience</i> Expression of Concern.
12/20/21	12/21/21	12.25%	12.12%	14.10%		<i>Neuroscience</i> found "no evidence" of data manipulation in a 2005 paper, and released study data. Dr. Bik raised concerns about the data.
1/3/22	1/3/22	6.82%	6.77%	7.49%		<i>Molecular Neurodegeneration</i> retracted a 2021 paper published with data from Dr. Wang's lab.

Cassava Sciences, Inc. Residual Return on Alleged Corrective Disclosure Impact Dates

Event Date	Impact Date ^[1]	Residual 8-K Event Study Model ^[2]	Residual 8-K without Earnings Announcements Event Study Model ^[2]	Residual Top Article Count Event Study Model ^[2]	In Feinstein Summary of Allegations? ^[3]	Alleged Corrective Event
3/22/22	3/22/22	-2.17%	-2.29%	-2.30%		<i>Neurobiology of Aging</i> issued an Expression of Concern regarding a 2017 paper by Dr. Burns and Wang.
3/30/22	3/30/22	-1.34%	-1.23%	-1.33%		<i>PLOS One</i> retracted five papers authored by Dr. Burns and Wang.
4/18/22	4/19/22	-16.02%*	-16.11%*	-15.72%*	✓	<i>The New York Times</i> published an "exposé" on Cassava .
4/20/22 ^[4]	4/20/22	-9.77%	-9.75%	-9.88%		Continued response to <i>New York Times</i> article.
6/1/22	6/1/22	-11.30%	-11.31%	-11.51%		<i>Alzheimer's Research & Therapy</i> retracted a 2017 paper published by Dr. Wang.
7/27/22	7/27/22	-18.16%*	-18.10%*	-17.49%*	✓	<i>Reuters</i> published a story discussing the DOJ's commencement of a criminal investigation into Cassava.
10/12/23	10/13/23	-16.39%*	-16.37%*	-16.36%*	✓	Leaked document regarding CUNY's investigation into Dr. Wang published by <i>Science</i> magazine.
10/16/23 ^[4]	10/16/23	-17.38%*	-17.35%*	-17.29%*		Continued response to news regarding CUNY investigation.

Source: CRSP; Feinstein Report; Supplemented Consolidated Complaint

Note:

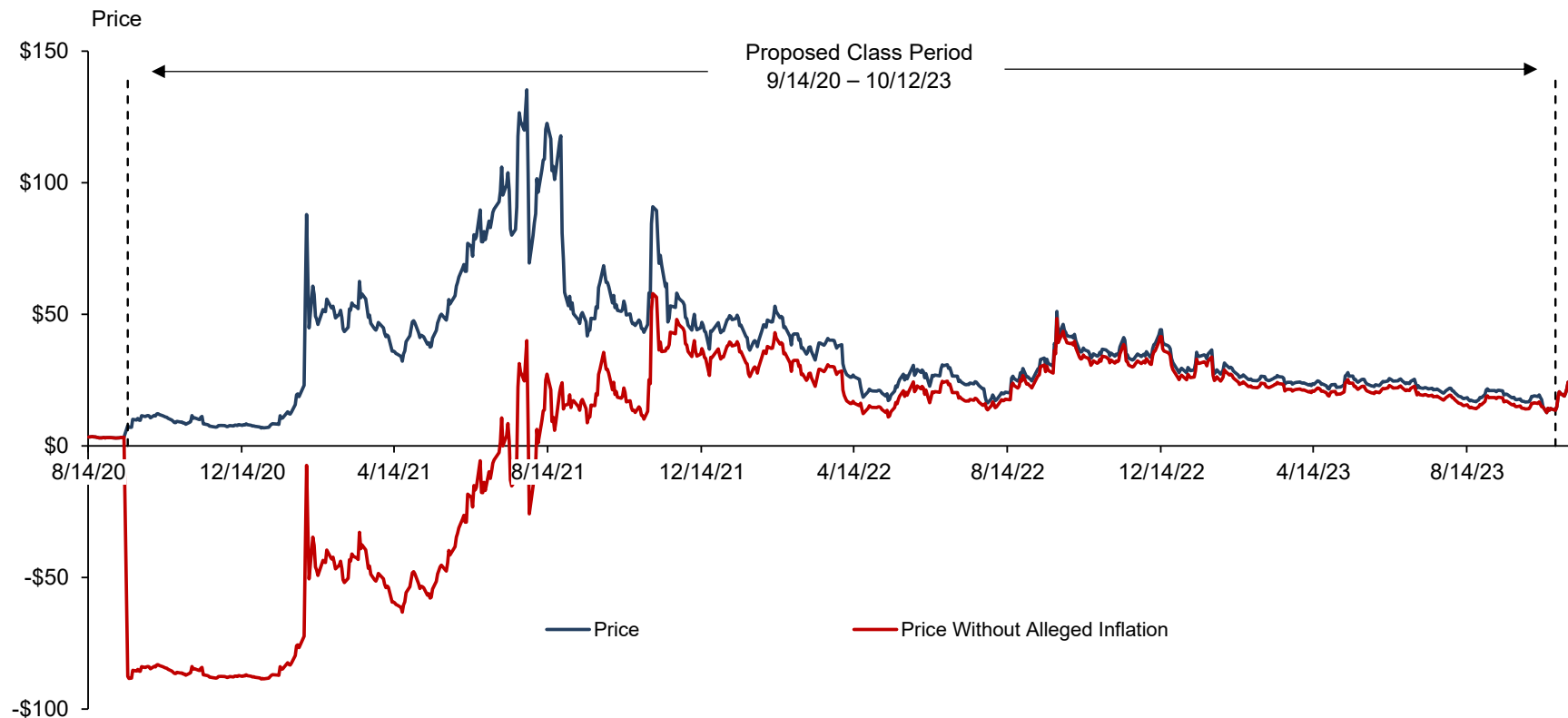
[1] Alleged corrective disclosures are identified as dates on which Plaintiffs discuss allegedly corrective information that was disclosed in Section I as well as Sections VII–IX of the Supplemented Consolidated Complaint. If a timestamp is unavailable, the date of the information release discussed in the complaint is used as the impact date.

[2] Residuals through 7/27/22 are as reported in the Feinstein Report. The residuals for 10/13/23 and 10/16/23 are calculated by extending Dr. Feinstein's event study regression model. Residuals flagged with "*" are statistically significant at the 95% confidence level.

[3] Includes alleged disclosures included in Feinstein Report, Section V.

[4] Plaintiffs allege that the trading day following the impact date of the alleged corrective disclosures on 8/25/21, 12/17/21, 4/18/22, and 10/12/23 showed a continued market response to the allegedly disclosed information.

Cassava Sciences, Inc. Common Stock Price with Illustrative Dollar Inflation Band 8/14/20 – 11/13/23



Source: *Refinitiv*; Feinstein Report

Note: The blue line shows the stock price of Cassava from 8/14/20 to 11/12/23. Price Without Alleged Inflation is calculated using a tiered dollar inflation band based on the residual return from Dr. Feinstein's 8-K event study for each of the alleged corrective disclosures discussed in the Feinstein Report.

EXHIBIT 2

Feinstein, Ph.D. CFA, Steven

June 14, 2024

IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
AUSTIN DIVISION

In re CASSAVA SCIENCES INC.
SECURITIES LITIGATION,

_____) Master File No.
) 1:21-cv-00751-DAE
This Document Relates to:)
)
ALL ACTIONS.)
_____)

VIDEOTAPED DEPOSITION OF STEVEN FEINSTEIN, Ph.D., CFA

SAN DIEGO, CALIFORNIA

FRIDAY, JUNE 14, 2024

9:08 A.M.

Stenographically reported by:

Kayla Lotstein

California CSR No. 13916, CRR, RPR, CRC

Henderson Legal Services

202-220-4158

www.hendersonlegalservices.com

Feinstein, Ph.D. CFA, Steven

June 14, 2024

2

1 IN THE UNITED STATES DISTRICT COURT
2 FOR THE WESTERN DISTRICT OF TEXAS
3 AUSTIN DIVISION

4 In re CASSAVA SCIENCES INC.)
5 SECURITIES LITIGATION,)
6 _____) Master File No.
7 This Document Relates to:) 1:21-cv-00751-DAE
8 ALL ACTIONS.)
9 _____)

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14 VIDEOTAPED DEPOSITION OF STEVEN FEINSTEIN,
15 Ph.D., CFA, taken on behalf of Defendants, at
16 9:08 a.m., FRIDAY, May 17, 2024, at 655 West
17 Broadway, Suite 1900, San Diego, California,
18 before Kayla Lotstein, Certified Shorthand
19 Reporter No. 13916 of the State of California,
20 pursuant to Notice.

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Henderson Legal Services

202-220-4158

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Feinstein, Ph.D. CFA, Steven

June 14, 2024

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23 Also Present:

24 Larry Maher, Videographer

25 Brendan Travers

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Feinstein, Ph.D. CFA, Steven

June 14, 2024

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By Ms. Loseman

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Feinstein, Ph.D. CFA, Steven

June 14, 2024

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EXHIBITS

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Description

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"Exhibit E," Report on Market
Efficiency and Damages
Methodology, Professor Steven
P. Feinstein, Ph.D., CFA,
dated March 13, 2024

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Reuters Brief-Cassava
Sciences Announces Positive
cognition Data With Simufilam
in Alzheimer's Disease; dated
29 July 2021; Bates-stamped
FEINSTEIN_0004359

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Benzinga Article, "Why
Cassava Sciences Shares Are
Trading Sharply Lower Today,"
dated 29 July 2021 15:05;
Bates-stamped
FEINSTEIN_0004360

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JonesTrading Article dated
July 29, 2021, "Raising PT to
\$215/BUY. 9-Month Data
De-Risk 12-Month Data in
4Q21; Randomized Trial Data
Could be in 1H/mid22";
Bates-stamped FEINSTEIN_

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Feinstein, Ph.D. CFA, Steven

June 14, 2024

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INFORMATION TO BE SUPPLIED

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(None)

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QUESTIONS INSTRUCTED NOT TO ANSWER

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Feinstein, Ph.D. CFA, Steven

June 14, 2024

26

1 represent and state that everything I have done confirms 09:32:55

2 my opinions. 09:33:00

3 Q Well, what else have you done? You mentioned 09:33:00

4 you looked at news coverage, the Internet, and Google 09:33:02

5 search, the Factiva search. You've looked at additional 09:33:05

6 analyst reports and the judge's opinion on the motion to 09:33:10

7 supplement. 09:33:13

8 Anything else? 09:33:14

9 A Yes. As I'm thinking about it now, I did have 09:33:14

10 one of my assistants check frequency of mention of 09:33:19

11 Cassava on Reddit and count those numbers and compare 09:33:23

12 them to the frequency of other stocks mentioned on 09:33:25

13 Reddit, and it confirmed that my analysis was complete 09:33:30

14 and that my conclusion was reliable, that -- that 09:33:36

15 comparison. And I don't think I need to offer that 09:33:40

16 because essentially what I did was confirm that my 09:33:43

17 analysis was complete, which is the opinion I had at the 09:33:45

18 time I turned in the report, and it's just further 09:33:51

19 confirmed by additional data that I looked at since 09:33:54

20 then. 09:33:57

21 Q When did you do this Reddit analysis? 09:33:58

22 A Sometime in the last two weeks. 09:34:01

23 Q Do you still have the -- that analysis? 09:34:03

24 A Well, I'm not sure if we have it written down, 09:34:06

25 but it's easy to replicate. I asked someone to check 09:34:11

Feinstein, Ph.D. CFA, Steven

June 14, 2024

32

1 I -- I considered that one, gave it the due 09:41:02
2 consideration, and determined that the generally 09:41:06
3 accepted standard evaluation of market efficiency was 09:41:10
4 the appropriate one. 09:41:13

5 I mean, I can't run -- I figured that if 09:41:14
6 someone's going to raise that argument, I can get it on 09:41:16
7 rebuttal. I didn't really need to address it in this 09:41:21
8 opening report. 09:41:23

9 It's a -- Cassava stock did not -- did not 09:41:24
10 range outside the range of what was reasonable given the 09:41:25
11 information that was being disseminated about it, and 09:41:28
12 all the market factors indicate market efficiency. The 09:41:30
13 empirics indicate market efficiency. 09:41:37

14 I had that one question about how much was 09:41:41
15 Cassava really being mentioned on the Internet, so I 09:41:43
16 asked my assistant to look into it, and he confirmed for 09:41:45
17 me that it was not nearly as much as the mention of -- 09:41:48
18 of the stocks that are often cited in the short list of 09:41:50
19 meme stocks. So that confirmed that my analysis was 09:41:54
20 complete and appropriate. 09:41:58

21 Q If it's raised in an opposing expert report, 09:42:01
22 do you intend to submit a supplement or a reply report? 09:42:06

23 A Oh, I would hope that I have the opportunity 09:42:09
24 to. I think that would be a very easy argument to 09:42:11
25 refute. 09:42:13

Feinstein, Ph.D. CFA, Steven

June 14, 2024

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1 Very simple. I said, "Luca, can you tell me how 10:14:20

2 frequently Cassava was mentioned on Reddit over the 10:14:23

3 course of the class period?" That's all I asked him. 10:14:27

4 He said, "Yes," and then later told me a 10:14:31

5 number. 10:14:36

6 Q Do you recall what that number was? 10:14:36

7 A Somewhere in the three hundreds, and then he 10:14:38

8 added that other companies like GameStop are, like, 10:14:41

9 30,000. 10:14:48

10 Q Did he comment -- so you said he added 10:14:52

11 GameStop comments numbered in the 30,000. 10:14:57

12 Did he mention any other companies? 10:15:02

13 A No. 10:15:04

14 Q Did you ask him to compare the number of times 10:15:07

15 Cassava was mentioned to any other company, or did he do 10:15:10

16 that on his own? 10:15:15

17 MS. JENSEN: Asked and answered. 10:15:17

18 THE WITNESS: He did that on his own. 10:15:19

19 I do want to add that I did check the 10:15:20

20 deposition that I did a month ago, a month and a half 10:15:23

21 ago was Valiant. 10:15:26

22 BY MS. LOSEMAN: 10:15:28

23 Q Thank you for that. 10:15:28

24 A It was in early May. 10:15:30

25 Q And did you instruct your colleague to check 10:15:44

Feinstein, Ph.D. CFA, Steven

June 14, 2024

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1 methodology at the class certification stage? 04:50:22

2 **A Yes, I have.** 04:50:26

3 **Q And is this essentially the same opinion** 04:50:26

4 **you've provided in other securities class actions at the** 04:50:30

5 **certification stage about a common damages methodology?** 04:50:38

6 **A No.** 04:50:43

7 **Q What portion of this part of your report is** 04:50:44

8 **specific to Cassava and the alleged misrepresentations** 04:50:48

9 **and corrective disclosures here?** 04:50:52

10 **A On paragraph 122, it says that "the** 04:51:27

11 **out-of-pocket damages methodology, which is the same** 04:51:31

12 **methodology that is used in virtually all 10b5 security** 04:51:34

13 **cases, is consistent in this case with this plaintiff's** 04:51:39

14 **theory of liability in this case."** 04:51:44

15 **So that's what paragraph 1 -- 222 says, and** 04:51:45

16 **that's never an opinion I've never offered before.** 04:51:49

17 **And also in 222, I say that "in this case, it** 04:51:52

18 **can be applied commonly to all class members -- or for** 04:51:55

19 **all class members."** 04:51:58

20 **Q I'm sorry. I just want to make sure I** 04:52:05

21 **understand your testimony.** 04:52:06

22 **You said you've never offered the opinion** 04:52:07

23 **before that's expressed in paragraph 222?** 04:52:15

24 **A Correct. That the out-of-pocket damages** 04:52:19

25 **methodology is consistent with plaintiff's theory of** 04:52:21

Feinstein, Ph.D. CFA, Steven

June 14, 2024

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1 liability in the -- in the Cassava case. 04:52:25

2 I mean, I've found that it's consistent with 04:52:27

3 the theory of liability in many other cases, but not in 04:52:30

4 the Cassava case. And so I evaluated the theory of 04:52:33

5 liability in this case and determined that this, again, 04:52:37

6 is the appropriate methodology, but that's analysis 04:52:40

7 specific this to this case. 04:52:44

8 Q So -- thank you for that -- that 04:52:46

9 clarification. 04:52:47

10 So you're not saying you have never in any 04:52:48

11 other case reached the conclusion that the out-of-pocket 04:52:50

12 damages methodology is consistent with the plaintiff's 04:52:54

13 theory of liability? 04:52:57

14 A Correct. It almost always is, and -- 04:52:59

15 Q Have you -- 04:53:02

16 A But that requires an understanding of the 04:53:02

17 plaintiff's theory of liability, and I did that work 04:53:05

18 here to see what the theory of liability is and whether 04:53:07

19 it makes sense in this case to apply this damage 04:53:10

20 methodology. 04:53:13

21 Q Have you ever considered in any other 04:53:20

22 engagement whether the Plaintiffs' theory of liability 04:53:23

23 was, in fact, inconsistent with the out-of-pocket 04:53:29

24 damages methodology? 04:53:34

25 A Any other -- 04:53:37

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1 essentially insulate the stock price from any effect of 05:09:13
2 the later misrepresentations. 05:09:15

3 So there could have been a disclosure that 05:09:17
4 was -- that -- that preemptively corrected inflation 05:09:19
5 that otherwise would be caused by a later 05:09:22
6 misrepresentation. 05:09:25

7 BY MS. LOSEMAN: 05:09:27

8 Q And in constructing a damages analysis, you 05:09:27
9 would have to disentangle -- right? -- the impact of any 05:09:29
10 prior disclosure that -- in -- in that hypothetical 05:09:34
11 answer you just provided somehow impacted the -- any 05:09:37
12 change or non-change in the price of the stock when the 05:09:44
13 alleged misrepresentation occurred; right? 05:09:49

14 MS. JENSEN: Objection to the form. 05:09:51

15 THE WITNESS: No. 05:09:53

16 The methodology is much more straightforward 05:09:53
17 than that. 05:09:56

18 BY MS. LOSEMAN: 05:09:57

19 Q How so? 05:09:57

20 A Well, what the methodology is to use all 05:09:58
21 available information. 05:10:01

22 The information is set -- the information set 05:10:02
23 that's available to investors on each day of the class 05:10:04
24 period and assess, using all tools available, what would 05:10:06
25 the stock price have been had there been no 05:10:09

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1 misrepresentations or omissions. That's -- then the 05:10:13
2 difference between that but-for price and the actual 05:10:17
3 price is artificial inflation, and the damage formula is 05:10:20
4 the change in that artificial inflation over each 05:10:25
5 investor's respective holding period. 05:10:27

6 This kind of disentangling or attribution 05:10:31
7 generally is -- is not necessary in order to apply this 05:10:38
8 very straightforward arithmetic damages methodology. 05:10:41

9 Q How would you evaluate the impact of 05:11:00
10 information that was incrementally new on alleged 05:11:05
11 corrective disclosure dates? 05:11:11

12 A Could I hear that again, please. 05:11:15

13 Q How would you evaluate the impact of 05:11:17
14 information that was incrementally new on alleged 05:11:21
15 corrective disclosure dates? 05:11:25

16 MS. JENSEN: Objection to the form. 05:11:28

17 THE WITNESS: Well, there are a number of ways. 05:11:34
18 One way is a fundamental valuation analysis taking into 05:11:38
19 account change in variable values indicated by that 05:11:42
20 incremental news. 05:11:46

21 Another way is to assess what the stock price 05:11:49
22 would have been in the but-for world, but for all of the 05:11:52
23 misrepresentations and omissions in order to observe 05:11:55
24 what the but-for price is. And the difference between 05:12:00
25 the but-for price on that particular day, and the 05:12:05

Feinstein, Ph.D. CFA, Steven

June 14, 2024

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1 STATE OF CALIFORNIA)
2) ss.
3 COUNTY OF ORANGE)
4
5
6

7 I, the undersigned, say that I have read the
8 foregoing deposition, and I declare, under penalty of
9 perjury, that the foregoing is a true and correct
10 transcript of my testimony contained therein.

11 EXECUTED this _____ day of _____,
12 2024, at _____, California's.

13
14
15
16 _____
17 STEVEN FEINSTEIN, PH.D., CFA
18
19
20
21
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23
24
25

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1 BE IT KNOWN that the foregoing proceedings were taken
2 before me; that the witness before testifying was duly
3 sworn to testify to the whole truth; that the foregoing
4 pages are a full, true and accurate record of the
5 proceedings, all done to the best of my skill and
6 ability; that the proceedings were taken down by me in
7 stenographic shorthand and thereafter reduced to print
8 under my direction.

9
10 I CERTIFY that I am in no way related to any
11 of the parties hereto, nor am I in any way
12 interested in the outcome thereof.

13
14 () Review and signature requested.
15 () Review and signature waived.
16 (x) Review and signature neither requested
17 nor waived.

18
19 IN WITNESS WHEREOF, I have subscribed my name
20 this 17th day of June, 2024.

21
22
23
24
25

Kayla Lotstein
Kayla Lotstein, California CSR No. 13916

EXHIBIT 3

Bozorgi, Mahammad

May 17, 2024

IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
AUSTIN DIVISION

In re CASSAVA SCIENCES INC.
SECURITIES LITIGATION,

_____) Master File No.
) 1:21-cv-00751-DAE
This Document Relates to:)
)
ALL ACTIONS.)
_____)

VIDEOTAPED DEPOSITION OF MOHAMMAD BOZORGI

SAN DIEGO, CALIFORNIA

FRIDAY, MAY 17, 2024

9:14 A.M.

Stenographically reported by:

Kayla Lotstein
California CSR No. 13916, CRR, RPR, CRC

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May 17, 2024

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1 IN THE UNITED STATES DISTRICT COURT
2 FOR THE WESTERN DISTRICT OF TEXAS
3 AUSTIN DIVISION

4 In re CASSAVA SCIENCES INC.)
5 SECURITIES LITIGATION,)
6 _____) Master File No.
7 This Document Relates to:) 1:21-cv-00751-DAE
8 ALL ACTIONS.)
9 _____)

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VIDEOTAPED DEPOSITION OF MOHAMMAD BOZORGI
taken on behalf of Defendants, at 9:14 a.m.,
FRIDAY, May 17, 2024, at 655 West Broadway,
Suite 1900, San Diego, California, before
Kayla Lotstein, Certified Shorthand Reporter
No. 13916 of the State of California, pursuant
to Notice.

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Bozorgi, Mahammad

May 17, 2024

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24 Larry Maher, Videographer
25

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Lead Plaintiff Mohammad
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E-mail correspondence from
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3	11	E-mail correspondence from Khadem Massiah to	263
4		sirroond@aol.com, sent	
5		Saturday, 9/4/2021 9:12:49 AM	
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6	12	E-mail correspondence from Khadem Massiah to Konstantin	279
7		X. Rusin, sent Thursday,	
8		9/2/2021 3:00:17 PM	
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9	13	E-mail correspondence from Khadem Massiah to Thomas G.	283
10		Zippilli, sent Tuesday,	
11		9/28/2021 4:19:13 PM	
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12	14	HSBC Correspondence to Mohammad Bozorgi dated	292
13		September 8, 2021	
14	15	E-mail correspondence from Thomas D. Mauriello to Khadem	296
15		Massiah, sent Thursday,	
16		10/7/2021 6:35:12 AM	
		Coordinate Universal Time	
17	16	Labaton Sucharow	309
18		Correspondence dated	
19		August 18, 2021; Citizen	
		Petition	
20	17	Correspondence with header,	312
21		"CONFIDENTIAL:	
22		ATTORNEY-CLIENT PRIVILEGED";	
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of investment experience, is that right? 10:41:59

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1 A That is correct, sir. 10:42:01

2 Q What's your 20 years of investment experience? 10:42:02

3 A This is related to my construction business. 10:42:08

4 Real estate, basically. That's what I mean by that. 10:42:12

5 Q What investments have you made in real estate? 10:42:16

6 A I have bought some property and sold before. 10:42:20

7 Q What properties have you bought and sold? 10:42:25

8 A In Iran, and one property in Los Angeles I had 10:42:27

9 many years before, in Malibu. 10:42:34

10 Q What properties have you bought and sold in 10:42:38

11 Iran? 10:42:41

12 A Rental properties, mainly. 10:42:42

13 Q What rental properties? 10:42:46

14 **A** The ones we spoke about. 10:42:48

15 Q The two rental properties that you own in 10:42:52

16 Iran? 10:42:54

17 A Correct, sir. 10:42:55

18 Q You inherited those; right? 10:42:56

19 A Inherited and some of them -- some also I did 10:42:58

20 through the trading that I did myself. Not all of it's 10:43:03

21 inherited. Part of it is inherited. Part of it was my 10:43:07

22 own working experience. 10:43:12

23 Q You own a five-unit residential building in 10:43:16

24 Tehran; right? 10:43:20

25 A That is correct.

10:43:21

Bozorgi, Mahammad

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1 BY MR. CAMPBELL: 10:57:12

2 Q Sure. 10:57:13

3 So have you ever provided capital to a company 10:57:15

4 to support its operations? 10:57:20

5 A No, sir. 10:57:24

6 Q Aside from shares of stock, have you invested 10:57:41

7 in any other types of securities? 10:57:44

8 A No, sir. 10:57:53

9 Q Have you ever bought bonds? 10:57:55

10 A No, sir. 10:57:57

11 Q Have you ever invested in digital currency? 10:58:00

12 A No, sir. 10:58:04

13 Q Do you know what I mean by "digital currency"? 10:58:07

14 A Yes. The crypto, you mean. 10:58:10

15 Q You ever traded options? 10:58:14

16 A No, sir. I don't know what it is. 10:58:16

17 Q You don't know what a stock option is? 10:58:21

18 A No, sir. 10:58:24

19 Q You ever traded futures? 10:58:24

20 A I don't know that either. 10:58:26

21 Q You don't know what a future is? 10:58:29

22 A No, sir. 10:58:31

23 Q Have you ever taken a short position in a 10:58:38

24 stock? 10:58:40

25 A I don't even know what it means. What is a 10:58:41

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1 **short position?** 10:58:43

2 Q Have you ever made an investment seeking for 10:58:49

3 the stock value to go down? 10:58:52

4 A **No, sir. Why would I do that? You buy** 10:58:56

5 **something to go up.** 10:58:58

6 Q Well, there's a lot of people that do. 10:59:01

7 A **That's a gambling. I don't do those kind of** 10:59:04

8 **thing.** 10:59:07

9 Q Why do you say that's gambling? 10:59:08

10 A **Some -- nobody in their right mind would do** 10:59:10

11 **such a thing.** 10:59:12

12 Q Nobody in their right mind would bet on a -- 10:59:15

13 A **I would never do that.** 10:59:17

14 Q Why not? 10:59:19

15 A **Because that's not my job. I buy something to** 10:59:20

16 **have -- make profit.** 10:59:23

17 Q Do you know if you can make profit by shorting 10:59:28

18 a stock? 10:59:30

19 A **No, sir.** 10:59:32

20 Q Do you trade stocks on margin? 10:59:41

21 A **Can you tell me what it means?** 10:59:44

22 Q Have you ever borrowed money from -- 10:59:47

23 A **Yes, of course. Yes.** 10:59:49

24 Q Do you know what it means to trade on margin? 10:59:51

25 A **The money that I borrowed from the bank and** 10:59:54

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1 in Fairfax? 11:12:22

2 A Yes, sir, brother-in-law. Actually, her 11:12:24

3 sister was married -- I don't know what -- did I say it 11:12:27

4 right? 11:12:30

5 Q I see. Oh, I'm following you now. 11:12:31

6 So it was your second wife's sister's spouse? 11:12:33

7 A Yes. 11:12:38

8 Q Okay. Were you married to your second wife 11:12:39

9 while you lived in Fairfax? 11:12:44

10 A No, sir. At that time, I was divorced. 11:12:46

11 Q Were you married to your third wife when you 11:12:49

12 lived in Fairfax? 11:12:51

13 A No, sir. 11:12:54

14 Q Any other relatives living in Fairfax? 11:12:59

15 A My brother's wife and his children. My 11:13:08

16 brother is deceased now. His wife and their two 11:13:12

17 children also live there. 11:13:16

18 Q So your sister-in-law and your nieces and 11:13:17

19 nephews? 11:13:20

20 A Yes. I would say. 11:13:22

21 Q Any other relatives living in Fairfax? 11:13:29

22 A No. That's these two. 11:13:31

23 Q How long after you moved to Fairfax did you 11:13:38

24 open the HSBC account? 11:13:40

25 A Immediately. 11:13:45

25 0 Was that in 2020? 11:15:40

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1 stocks you intended to buy? 11:17:04

2 A No, sir. 11:17:06

3 [REDACTED] 11:17:18

4 [REDACTED] 11:17:21

5 A All my money's gone. Actually, it's -- 11:17:23

6 it's -- was not all my money. It's my whole family's 11:17:27

7 money because they trusted me. They gave me the money 11:17:32

8 to invest for them. Some of it was my money. 11:17:37

9 [REDACTED] 11:17:42

10 [REDACTED] 11:17:44

11 [REDACTED] 11:17:45

12 Q And other people's money as well? 11:17:50

13 A My family, close family. 11:17:52

14 Q Who else's money in your close family? 11:17:55

15 A My brother and my sister. The one, he's 11:17:57

16 die -- the one, he's deceased, also some of his money 11:18:01

17 also. 11:18:04

18 [REDACTED] 11:18:10

19 [REDACTED] 11:18:13

20 [REDACTED] 11:18:13

21 [REDACTED] 11:18:16

22 Q Was he alive at the time? 11:18:18

23 A Yes, sir. 11:18:20

24 [REDACTED] 11:18:26

25 [REDACTED] 11:18:28

1 A Why? I told him it would be a good 11:18:29

2 investment. 11:18:31

3 Q Why did you think it would be a good 11:18:34

4 investment? 11:18:35

5 A I don't know. I thought it would be a good 11:18:39

6 investment. 11:18:41

7 Q Why did you think it would be a good 11:18:43

8 investment? 11:18:45

9 MR. DROSMAN: Objection. Asked and answered. 11:18:47

10 THE WITNESS: I don't know, sir. 11:18:48

11 BY MR. CAMPBELL: 11:18:58

12 Q And this brother was living in Fairfax at the 11:18:58

```
13      time?                                     11:19:00
```

14 A No, sir. He was in Iran. 11:19:01

15 Q Has he ever lived in the US? 11:19:08

16 A No, sir.

11:19:11

17 Q Aside from your brother in Iran, did you 11:19:17

18 invest anyone else's money [REDACTED]? 11:19:19

19 A As I told you, my close family. My sisters 11:19:22

20 also. I have five sisters. 11:19:25

21 [REDACTED] 11:19:30

22 [REDACTED] 11:19:32

23 [REDACTED] [REDACTED] [REDACTED] 11:19:38

24 [REDACTED] 11:19:45

25 Q Your sister also live in Iran? 11:19:52

25 Q Has he ever been a US citizen? 11:21:05

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1 the name under the description is [REDACTED] [REDACTED] 01:16:31

2 Do you see that? 01:16:34

3 A Which one? 01:16:37

4 Q The first item in the description under 01:16:39

5 short term, it says "[REDACTED] [REDACTED]" 01:16:42

6 Do you see that? 01:16:44

7 [REDACTED] [REDACTED] 01:16:55

8 Page 11 of 25, we were talking about? 01:17:18

9 Q Thirteen, please. 01:17:20

10 A Sir? 01:17:21

11 Q Thirteen. Page 13. 01:17:22

12 A I'm on the wrong page. 01:17:24

13 Q At the very top on the left. 01:17:31

14 A Okay. 01:17:39

15 Q You see where it says "[REDACTED]"? 01:17:39

16 A Yes, I do. 01:17:42

17 Q This indicates that on January 27th, 2021, you 01:17:43

18 purchased [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]; is 01:17:48

19 that right? 01:17:58

20 A Correct. 01:17:58

21 Q And on that same day, you [REDACTED] [REDACTED] [REDACTED] [REDACTED] 01:17:58

22 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]; is that right? 01:18:03

23 A Can you repeat, please. 01:18:34

24 Q Sure. 01:18:35

25 That same day, January 27th, the date 01:18:36

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1 disposed, you [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] 01:18:39

2 [REDACTED]? 01:18:44

3 A On the date of 20- -- 27th; correct? 01:18:48

4 Q Yes. 01:19:01

5 A Okay. 01:19:01

6 Q Is that right? 01:19:02

7 A Yes, that is correct. 01:19:02

8 Q Why did you [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] 01:19:04

9 [REDACTED] on January 27th? 01:19:08

10 A Why did I [REDACTED]? 01:19:14

11 Q Yes. 01:19:17

12 A I thought it was good investment. 01:19:21

13 Q Why was it a good investment? 01:19:24

14 A I don't recall that that day. 01:19:35

15 Q What diligence did you do into [REDACTED] to 01:19:37

16 determine that you wanted to [REDACTED] [REDACTED] [REDACTED] [REDACTED] 01:19:39

17 [REDACTED]? 01:19:43

18 MR. DROSMAN: Objection. Vague and ambiguous. 01:19:43

19 THE WITNESS: I don't know. 01:19:49

20 BY MR. CAMPBELL: 01:19:51

21 Q Did you do any research into the company's 01:19:51

22 assets? 01:19:55

23 A I don't remember -- 01:19:56

24 MR. DROSMAN: Objection. Vague and ambiguous. 01:19:57

25 THE WITNESS: Sorry. Sorry. 01:19:58

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1	right?	01:41:07
2	MR. DROSMAN: Objection. Vague and ambiguous.	01:41:09
3	THE WITNESS: I don't know, sir.	01:41:11
4	BY MR. CAMPBELL:	01:41:12
5	Q Well, if you look at [REDACTED] [REDACTED] [REDACTED]	01:41:12
6	[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] on January 29th,	01:41:16
7	you sold on February 2nd, 2021; isn't that right?	01:41:21
8	A Can you repeat it, please.	01:41:28
9	Q Sure.	01:41:30
10	You [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] on	01:41:31
11	January 29th [REDACTED] [REDACTED]; right?	01:41:35
12	A Correct.	01:41:42
13	Q You sold it on February 2nd, 2021, [REDACTED]	01:41:43
14	[REDACTED]; correct?	01:41:48
15	A Okay.	01:41:54
16	Q So it dropped by more than 50 percent of its	01:41:54
17	value; isn't that right?	01:41:57
18	A Correct.	01:41:59
19	Q And you [REDACTED] [REDACTED] [REDACTED] [REDACTED]; is that --	01:41:59
20	A That is correct, sir.	01:42:03
21	Q Okay. [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]	01:42:04
22	[REDACTED] [REDACTED] [REDACTED] --	01:42:07
23	A That is --	01:42:08
24	MR. DROSMAN: Objection. Vague and ambiguous.	01:42:09
25	Just give me a moment to --	01:42:10

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1 Do you see that? 02:29:16

2 A Yes, sir. 02:29:19

3 Q So the total cost basis for [REDACTED] [REDACTED] 02:29:20

4 [REDACTED] in 2021 through September 30th is [REDACTED] [REDACTED] 02:29:25

5 [REDACTED] [REDACTED]; is that right? 02:29:32

6 A That is correct, sir. 02:29:35

7 Q Why did you [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] 02:29:37

8 in 2021? 02:29:40

9 A I don't know, sir. I don't remember. 02:29:43

10 Q If you funded your portfolio with something 02:29:48

11 around [REDACTED] [REDACTED], that's [REDACTED] [REDACTED] [REDACTED] [REDACTED] as you 02:29:50

12 put in there; is that right? 02:29:55

13 A I don't remember, sir. These are the numbers 02:29:58

14 according to these numbers. What it says is correct, 02:30:00

15 but I do not remember. 02:30:03

16 Q You also [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]; is 02:30:05

17 that right? 02:30:09

18 A According to this document, correct, sir. 02:30:10

19 Q Okay. Why would you [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] 02:30:13

20 [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] in 02:30:16

21 nine months? 02:30:20

22 MR. DROSMAN: Objection. Compound. 02:30:22

23 THE WITNESS: I don't know, sir. 02:30:26

24 BY MR. CAMPBELL: 02:30:28

25 Q Did you have a strategy? 02:30:29

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1	MR. DROSMAN: Objection. Vague and ambiguous.	02:30:31
2	THE WITNESS: Not that I recall, sir.	02:30:34
3	BY MR. CAMPBELL:	02:30:57
4	Q Is that a normal trading year for you?	02:30:59
5	MR. DROSMAN: Objection. Vague and ambiguous.	02:31:00
6	THE WITNESS: I do not know, sir.	02:31:08
7	BY MR. CAMPBELL:	02:31:09
8	Q In any other year other than 2021, had you	02:31:09
9	ever [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]	02:31:11
10	[REDACTED]?	02:31:15
11	A I do not know, sir.	02:31:17
12	Q You don't know?	02:31:18
13	A I do not remember. If the paper says, then I	02:31:20
14	have done it, but I don't remember.	02:31:22
15	What does the paper says? Whatever it says	02:31:27
16	has taken place.	02:31:30
17	Q But I'm asking you, setting aside the paper	02:31:31
18	for 2021, in any other year had you [REDACTED] [REDACTED] [REDACTED] [REDACTED]	02:31:33
19	[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]?	02:31:38
20	MR. DROSMAN: Objection. Asked and answered.	02:31:40
21	THE WITNESS: I don't remember, sir.	02:31:43
22	BY MR. CAMPBELL:	02:31:54
23	Q Was your stock trading in 2021 a memorable	02:31:55
24	experience for you?	02:31:58
25	MR. DROSMAN: Objection. Vague and ambiguous.	02:31:59

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1 in Cassava stock, and that same day, you sold another 02:50:41

2 25,000 shares of Cassava stock? 02:50:46

3 MR. DROSMAN: Objection. Vague and ambiguous. 02:50:53

4 BY MR. CAMPBELL: 02:50:54

5 Q Is that right? 02:50:55

6 A That is correct, sir. 02:50:54

7 Q So for a third time in two weeks, you bought 02:50:57

8 and sold \$25,000 worth of Cassava stock -- or 25,000 02:51:01

9 shares of Cassava stock? 02:51:05

10 A That is correct, sir. 02:51:08

11 Q Why would you do that? 02:51:09

12 A I do not remember, sir. 02:51:18

13 Q Sitting here today, do you understand why you 02:51:20

14 would buy and sell millions of dollars in Cassava stock 02:51:22

15 day to day? 02:51:26

16 MR. DROSMAN: Objection. Asked and answered. 02:51:27

17 Vague and ambiguous. 02:51:29

18 THE WITNESS: I don't remember, sir. 02:51:31

19 BY MR. CAMPBELL: 02:51:33

20 Q But sitting here today, do you have an 02:51:33

21 understanding, based on your knowledge of yourself and 02:51:36

22 how you make decisions, why you would buy and sell 02:51:38

23 25,000 shares of Cassava stock in the same day? 02:51:43

24 MR. DROSMAN: Objection. Asked and answered. 02:51:46

25 Vague and ambiguous. Compound. 02:51:48

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1 else was to be -- has to be sold because it was all 03:47:08

2 bank's money. It was not my money. 03:47:11

3 This is a very important day. I remember this 03:47:18

4 very well. 03:47:21

5 Q How did you learn about the sale? 03:47:21

6 A They told me about it. 03:47:25

7 Q Who? 03:47:26

8 A Konstantin. 03:47:32

9 Q How did he tell you? 03:47:33

10 A I don't remember how, but as I said, this is a 03:47:35

11 very important e-mail. 03:47:38

12 Q Well, you just told me you remember this very 03:47:39

13 well, so what do you remember? 03:47:41

14 A This is what I remember. This e-mail, I 03:47:42

15 remember, is the day that Cassava Science wrongdoing 03:47:45

16 caused me to lose my whole life. That's all I remember. 03:47:48

17 Q Do you remember -- do you remember -- 03:47:53

18 A And I repeat it again. 03:47:53

19 Q Do you remember sending this e-mail? 03:47:57

20 A Of course I remember sending this e-mail. 03:47:58

21 Q What device did you send it from? 03:48:01

22 A I do not remember what device, sir. 03:48:03

23 Q Do you recall if you were in Fairfax? 03:48:05

24 A I do not remember, sir. 03:48:09

25 Q Do you recall if you were in the United 03:48:09

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1 States? 03:48:10

2 A I do not remember, sir. 03:48:11

3 Q Do you recall if you were in Iran? 03:48:12

4 A I do not remember, sir. 03:48:14

5 Q Do you recall how you learned that HSBC had 03:48:19

6 sold Cassava stock without your consent? 03:48:23

7 MR. DROSMAN: Objection. Asked and answered. 03:48:26

8 THE WITNESS: I don't remember. 03:48:30

9 BY MR. CAMPBELL: 03:48:31

10 Q Do you remember if it was by e-mail? 03:48:32

11 A I do not remember, sir. 03:48:34

12 Q Do you remember if it was a phone call? 03:48:35

13 A I do not remember, sir. 03:48:37

14 Q Did they tell you how many shares they sold? 03:48:44

15 A Do not remember, sir. 03:48:47

16 Q Did they tell you how much you lost? 03:48:48

17 A Do not remember, sir. 03:48:51

18 Q Do you know why Cassava stock went down in 03:48:55

19 value? 03:48:57

20 MR. DROSMAN: Objection. Calls for speculation. 03:48:58

21 Vague and ambiguous. 03:49:02

22 THE WITNESS: I don't remember, sir. 03:49:06

23 BY MR. CAMPBELL: 03:49:08

24 Q So you don't know what caused the losses in 03:49:09

25 Cassava stock at the end of August 2021? 03:49:13

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1 A That is correct. 04:04:22

2 Q And the next day after that same day, 04:04:22

3 August 20th, you also sold 5,000 shares? 04:04:24

4 A Yes, sir.

04:04:29

5 Q So essentially each day from August 17th to 04:04:32

6 August 20th, you were buying and selling more than a 04:04:38

7 half a million dollars in Cassava stock? 04:04:41

8 A Yes, sir. 04:04:46

9 Q And then on August 13th in your e-mail -- or 04:04:53

10 August 31st in your e-mail, you note that HSBC had sold 04:04:56

11 some shares without your consent; is that right? 04:05:01

12 A Yes, sir.

04:05:05

13 Q Okay. And having walked through those trades 04:05:05

14 at 5,000 shares each, does that refresh your 04:05:07

15 recollection as to whether or not it was you or HSBC who 04:05:10

16 made the follow- -- the subsequent sales of 10,900 and 04:05:14

17 550 shares on August 30th? 04:05:21

18 A No, sir.

04:05:24

19 Q You don't recall who made those sales? 04:05:27

20 A No, sir.

04:05:32

21 Q But the sales -- the forced sales by HSBC 04:05:39

22 caused you to lose money? 04:05:45

23 A Can you repeat the question, please. 04:05:49

24 Q Sure. 04:05:50

25 The forced sales by HSBC caused you to lose 04:05:51

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1 versus 750,000 USD." 04:17:22

2 Should the first be USD also? 04:17:27

3 **A I don't know, sir.** 04:17:32

4 **Q You don't know?** 04:17:33

5 **A No, sir.** 04:17:35

6 **Q Okay. So in any case, it says, "If I was** 04:17:36

7 **notified on time that day my losses would have been** 04:17:40

8 **200,000-something versus 750,000 USD"; is that right?** 04:17:43

9 **A That is correct.** 04:17:49

10 **Q Why would your losses have been 200,000** 04:17:49

11 **instead of 750,000?** 04:17:53

12 **A Okay. Now I explain it to you, sir.** 04:17:55

13 **See, as I said before, they did the house call** 04:17:57

14 **without me telling -- telling me. But later on, I even** 04:18:01

15 **tried to call some law firm to say, look, are they able** 04:18:05

16 **to do that? They said yes. They're entitled to sell** 04:18:09

17 **any shares that they choose, you know? They don't have** 04:18:13

18 **to have my consent.** 04:18:17

19 **I even spoke to some law firm to see if I can** 04:18:19

20 **maybe cover up, you know, what they have done, but they** 04:18:23

21 **said, no, it's -- this is the rules and regulation.** 04:18:26

22 **This is what you sign when you first -- they -- you did** 04:18:29

23 **the margin call. You know, if you get a call, if you** 04:18:32

24 **don't sell, the bank will sell for you.** 04:18:35

25 **This is what it's all about.** 04:18:37

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1 Q So they sold because you didn't sell? 04:18:39

2 A Correct, sir. 04:18:42

3 Q Okay. And if you'd been notified on that day, 04:18:43

4 then your losses would have only been 200,000 instead of 04:18:45

5 750,000? 04:18:48

6 A Well, this is something that I wrote for them. 04:18:49

7 It's not -- the numbers are not exactly. I was trying 04:18:51

8 to see if there's any way that these guys will be able 04:18:53

9 to sell and then there was -- you know, put things the 04:18:58

10 way they were, and then me have a choice to sell. 04:19:02

11 So I tried, but they said not possible. 04:19:08

12 Q How did you determine that your losses would 04:19:11

13 have been 200,000 versus -- 04:19:13

14 A As I said, this is just a number I throw at 04:19:14

15 them. I thought it would work, but it didn't work. 04:19:17

16 It's not a accurate number. 04:19:20

17 Q This isn't accurate? 04:19:23

18 A It's inaccurate, yes, sir. 04:19:25

19 Q Were you trying to get compensation from HSBC 04:19:27

20 for your losses? 04:19:30

21 A That is correct. Because of they sold without 04:19:31

22 my consent. 04:19:34

23 Then later on I spoke to a couple of attorney 04:19:36

24 firm. They said they can sell anytime they want once 04:19:40

25 you have what you call house call or Fed call, whatever 04:19:44

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1 e-mail. To make the long story short, next day I found 04:21:52
2 out that without my knowledge they have sold some 11,000 04:21:55
3 shares of Cassava which in result I am available that 04:21:58
4 would cover the house call, and my losses would have 04:22:04
5 been half that amount. So I need your feedback, and 04:22:07
6 I'll decide for be minimized. Yours truly." 04:22:10

7 Do you see that? 04:22:18

8 **A Yes, sir, I see that. This is all -- sir,** 04:22:19
9 **this is all these e-mails you're telling me, it's all** 04:22:22
10 **one thing, one house call. It's related to one** 04:22:24
11 **incident. Nothing else. Nothing more.** 04:22:27

12 Q And this is the sale of your Cassava stock on 04:22:30
13 August 30th; right? 04:22:33

14 **A If that's what it says, yes, sir.** 04:22:35

15 Q And they sold some 11,000 shares of Cassava; 04:22:37
16 right? 04:22:41

17 **A That is correct, sir.** 04:22:42

18 Q Does that refresh your recollection that the 04:22:43
19 11,400 shares of stock that were sold on your Exhibit A 04:22:45
20 ledger on August 30th were sold by HSBC? 04:22:51

21 **A I don't know yet, but according to this** 04:22:56
22 **document, yes, it is correct.** 04:22:58

23 Q Well, these are all your documents; right? 04:23:00

24 **A Correct, sir.** 04:23:02

25 Q Okay. 04:23:03

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1      A    There is no other documents.                                04:23:04
```

2 Q Okay. And you said your losses would have 04:23:10

3 been half that amount? 04:23:11

4 A Sir, you have asked me this question, and I've 04:23:12

5 answered you. This is the number I guesstimate at that 04:23:15

6 time. Okay? The numbers are not true. 04:23:19

7 I was trying to see whether I am able to cover 04:23:22

8 some of my losses from the bank or not. The numbers are 04:23:26

9 not exact, and it has nothing to do with my activity 04:23:30

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10      with the bank.                                04:23:37
```

11 They were allowed to sell as they wished, so I 04:23:37

```
12      tried to communicate with the bank whether it's in -- if 04:23:41
```

13 they have done a right thing or wrong thing. So I was 04:23:46

14 not able to cover up any money, and that was the law. 04:23:49

15 **Law has been served.** 04:23:52

16 And that's -- that's when I signed the first 04:23:53

17 day. If I don't make the house call, they will do it 04:23:56

18 for me. 04:23:59

19 So \$1 million, \$10 million, these are the 04:24:02

20 numbers. Okay? Did I get a penny from them? No. Did 04:24:06

21 anything happen? No. They said it's the rule. 04:24:09

22 0 And to be clear, the rule is if you don't 04:24:13

23 cover the house call in time, they can liquidate your 04:24:15

24 stock? 04:24:20

25 A That is correct, sir.

04:24:20

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1 your losses would have been half that amount? 04:25:15

2 MR. DROSMAN: Objection. Asked and answered. 04:25:18

3 THE WITNESS: No, sir. 04:25:20

4 BY MR. CAMPBELL: 04:25:26

5 Q The next e-mail up is a response to you saying 04:25:27

6 that they have escalated your e-mails to the compliance 04:25:29

7 department and they'll be sending you an acknowledgement 04:25:32

8 shortly. 04:25:35

9 They say, "My company policy mandates 04:25:36

10 conducting a detailed investigation of your 04:25:38

11 allegations." 04:25:40

12 Do you know whether HSBC did a detailed 04:25:41

13 investigation of your allegations? 04:25:43

14 A I don't know. We have to check the e-mails. 04:25:49

15 Q Okay. You respond on September 2nd at 10:45. 04:25:52

16 You say, "Hi again. I have a solution for 04:25:56

17 bank mistake. I would like to buy back the 11,450 04:25:58

18 shares of SAVA and instead sell total shares of [REDACTED] and 04:26:03

19 the balance sell some other security with my 04:26:08

20 coordination." 04:26:11

21 Do you see that? 04:26:12

22 A Yes, sir, I -- 04:26:13

23 Q So on September 2nd, 2021, you wanted to buy 04:26:14

24 back the 11,000 shares of Cassava? 04:26:17

25 A Not possible. How could it be? Not possible. 04:26:19

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1 **This was my suggestion. Did it happen? No. Did I get** 04:26:22

2 **any money? No.** 04:26:25

3 Q My question is just on September 2nd, you 04:26:26

4 **wanted to buy back the 11,450 shares of Cassava?** 04:26:29

5 A **I would have liked that, but it didn't happen.** 04:26:32

6 **I repeat again. I wanted to see if I can do** 04:26:34

7 **the shares that I would have -- I would wanted to sell,** 04:26:38

8 **but they had sold it already. How could I get it back?** 04:26:41

9 Q Okay. So you wanted to sell shares other than 04:26:45
10 Cassava? 04:26:47

11 A **If it was up to me, yes, as I said. Because** 04:26:48
12 **one hour or two hours I didn't answer, they sold it, so** 04:26:51
13 **I was -- I guess if I would have -- they would have** 04:26:56
14 **found me, maybe things would have been different.** 04:26:58

15 Q Was it just an hour or two that you didn't 04:27:01
16 respond? 04:27:03

17 A **I think so. I'm -- I don't remember, but I** 04:27:04
18 **think so. It's banks, they don't joke around.** 04:27:06

19 Q You'd asked for previous extensions on your 04:27:12
20 margin calls; right? 04:27:15

21 A **I don't remember, sir.** 04:27:16

22 Q We've looked at e-mails today where you 04:27:17
23 requested from Konstantin -- 04:27:19

24 A **Well, that date and this date is two different** 04:27:20
25 **things. Is it regarding to this date?** 04:27:23

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1 interpose the same objection. 04:47:30

2 This particular document was produced to 04:47:32

3 Defendants with Bates numbers and other markings, and 04:47:35

4 those Bates numbers and markings have been cut off 04:47:38

5 Exhibit 12, and for that reason, we object to the use of 04:47:42

6 this document. 04:47:45

7 MR. CAMPBELL: Okay. 04:47:46

8 BY MR. CAMPBELL: 04:47:49

9 Q Do you see this e-mail between Mr. Rusin and 04:47:49
10 yourself dated September 2nd, 2021? 04:47:51

11 A Can you repeat your question, please. 04:48:03

12 Q Sure. 04:48:05

13 Do you just recognize this as an e-mail from 04:48:05
14 you to Mr. Rusin, at the top of the page, on 04:48:07
15 September 2nd, 2021? 04:48:10

16 A Yes. 04:48:13

17 Q And you say, "Hi, Konstantin. I have 04:48:14
18 forwarded for you the e-mails O have sent to John. I 04:48:16
19 called the trade desk and I wanted to buy the SAVA back 04:48:22
20 and sell the [REDACTED] They said not possible." 04:48:26

21 Do you see that? 04:48:30

22 A Yes, I do. 04:48:30

23 Q Is this referencing the e-mails we were just 04:48:32
24 looking at between you and John Henien about exercising 04:48:34
25 a trade to buy back the Cassava stock? 04:48:37

25 Q I understand you don't remember, but before, 04:49:18

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1 yesterday during our call, the following has been 04:55:23

2 escalated to our compliance area for review," and so 04:55:25

3 forth. 04:55:28

4 You respond to that e-mail on September 27th, 04:55:30

5 2021, at 11:24 a.m. 04:55:35

6 Do you see that? 04:55:37

7 **A No, sir, I don't see it.** 04:55:38

8 Q It starts in the middle of the page under the 04:55:39

9 line marked "Public." 04:55:41

10 **A No, I don't see it.** 04:55:51

11 Q Right in the middle of the page, e-mail from 04:55:53

12 you to Mr. Zippilli dated September 27th. 04:55:54

13 Do you see that? 04:55:59

14 **A Yes, I see it now.** 04:56:02

15 Q Okay. And you say, "Hello, Thomas. I would 04:56:04

16 like to bring to your attention that HSBC margin 04:56:07

17 department caused my whole life saving go to drain." 04:56:11

18 Do you see that? 04:56:16

19 **A I see it.** 04:56:16

20 Q What do you mean the HSBC margin department 04:56:17

21 caused your whole life saving to go to the drain? 04:56:19

22 **A I do not remember, sir.** 04:56:23

23 Q Did you lose your life savings in 04:56:26

24 September of 2021? 04:56:28

25 **A I do not remember, sir.** 04:56:30

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1 Q Do you recall suffering any financial loss in 04:56:33

2 September of 2021? 04:56:35

3 A Do not remember, sir. 04:56:37

4 Q Do you remember believing that HSBC margin 04:56:43

5 department caused you to suffer financial losses in 04:56:46

6 September of 2021? 04:56:48

7 MR. DROSMAN: Objection. Asked and answered. 04:56:50

8 THE WITNESS: I don't remember, sir. 04:56:54

9 BY MR. CAMPBELL: 04:56:56

10 Q You go on to say, "But please do keep in mind 04:56:57

11 part of this big loss is due to forced sale by your team 04:56:59

12 which could have been solved other ways." 04:57:03

13 Do you see that? 04:57:06

14 A Yes, I do see it. 04:57:07

15 Q Do you recall what big loss you're talking 04:57:08

16 about? 04:57:10

17 A I've repeated over and over, I don't remember, 04:57:10

18 sir. 04:57:13

19 Q Do you recall a forced sale of your stock by 04:57:14

20 HSBC in September of 2021? 04:57:16

21 A No, sir, I do not recall. 04:57:19

22 Q Do you recall the other ways that that could 04:57:22

23 have been solved? 04:57:24

24 A I do not remember, sir. 04:57:26

25 Q You go on to say, "Can you update about my 04:57:30

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1 two paragraphs. I want to look at the third paragraph 05:02:18

2 on the bottom that says, "On May 27th, 2021." 05:02:20

3 Do you see that? 05:02:22

4 **A No, sir. Can you -- yes. On -- on the very** 05:02:22

5 **bottom; right?** 05:02:29

6 **Q Yes.** 05:02:31

7 **A Okay.** 05:02:32

8 **Q It says, "On May 27th, 2021, financial** 05:02:32

9 **consultant Konstantin Rusin contacted you via e-mail to** 05:02:35

10 **advise you of a margin call you had on your account to** 05:02:40

11 **which you requested an extension and promised not to do** 05:02:43

12 **it again. In addition, because of the high volatility** 05:02:46

13 **and continued margin calls on your account, Mr. Rusin** 05:02:50

14 **requested that you meet to discuss your investment** 05:02:53

15 **strategy."** 05:02:55

16 Do you see that? 05:02:57

17 **A That is correct, sir.** 05:02:58

18 **Q Do you understand that to be a reference to** 05:02:59

19 **the e-mail we looked at earlier from Mr. Rusin to you on** 05:03:01

20 **May 27th asking to discuss your investment strategy?** 05:03:03

21 **A Yes, sir.** 05:03:07

22 **Q Do you know what it means that you had high** 05:03:07

23 **volatility and continued margin calls in your account?** 05:03:09

24 **A No, sir.** 05:03:13

25 **Q Do you know what "high volatility in your** 05:03:13

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1 account" means? 05:03:17

2 A No, sir. 05:03:18

3 Q Do you know what "continued margin calls" are? 05:03:18

4 A No, sir. 05:03:21

5 Q And you didn't discuss your investment 05:03:23

6 strategy with Mr. Rusin; is that right? 05:03:25

7 A That is correct, sir. 05:03:28

8 Q Looking at the next page, the second paragraph 05:03:30

9 starts, "Based upon the foregoing." 05:03:36

10 Do you see that? 05:03:38

11 A That is correct. 05:03:38

12 Q It says, "Based upon the foregoing, HSBC 05:03:39

13 believes that you were fully informed of the terms and 05:03:42

14 conditions of your account and how margin calls work. 05:03:45

15 We will not be offering you remuneration related to this 05:03:48

16 matter. In addition, based on the activity in your 05:03:52

17 account and your large margin balance, HSBC is choosing 05:03:54

18 to no longer conduct business with you." 05:03:56

19 Do you see that? 05:04:00

20 A Yes, sir, I do. 05:04:01

21 Q So HSBC cut you off from further trading? 05:04:03

22 A Yes. 05:04:06

23 MR. DROSMAN: Objection. Vague and ambiguous. 05:04:06

24 THE WITNESS: Sorry. 05:04:07

25

Bozorgi, Mahammad

May 17, 2024

329

1 STATE OF CALIFORNIA)
2) ss.
3 COUNTY OF ORANGE)
4
5
6

7 I, the undersigned, say that I have read the
8 foregoing deposition, and I declare, under penalty of
9 perjury, that the foregoing is a true and correct
10 transcript of my testimony contained therein.

11 EXECUTED this _____ day of _____,
12 2024, at _____, California's.
13
14
15

16 _____
MOHAMMAD BOZORGI
17
18
19
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21
22
23
24
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Bozorgi, Mahammad

May 17, 2024

330

1 BE IT KNOWN that the foregoing proceedings were taken
2 before me; that the witness before testifying was duly
3 sworn to testify to the whole truth; that the foregoing
4 pages are a full, true and accurate record of the
5 proceedings, all done to the best of my skill and
6 ability; that the proceedings were taken down by me in
7 stenographic shorthand and thereafter reduced to print
8 under my direction.

9
10 I CERTIFY that I am in no way related to any
11 of the parties hereto, nor am I in any way
12 interested in the outcome thereof.

13
14 () Review and signature requested.

15 () Review and signature waived.

16 (X) Review and signature neither requested
17 nor waived.

18
19 IN WITNESS WHEREOF, I have subscribed my name
20 this 31st day of May, 2024.

21

22

23

Kayla Lotstein

24

Kayla Lotstein, California CSR No. 13916

25

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EXHIBIT 4

Calderone, Kenneth

May 9, 2024

1

IN THE UNITED STATES DISTRICT COURT

FOR THE WESTERN DISTRICT OF TEXAS

AUSTIN DIVISION

- - - - -x

In re CASSAVA SCIENCES INC.

Master File No.

1:21-CV-00751-DAE

SECURITIES LITIGATION

- - - - -x

VIDEO-RECORDED DEPOSITION OF KENNETH CALDERONE

New York, New York

Thursday, May 9, 2024

Reported by:
Jeffrey Benz, CRR, RMR
Job No. 55434

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Calderone, Kenneth

May 9, 2024

2

1

2 VIDEO DEPOSITION of KENNETH CALDERONE, taken
3 by Defendants, at the offices of Robbins Geller
4 Rudman & Dowd LLP, 420 Lexington Avenue, New York,
5 New York, on May 9, 2024, commencing at 9:03 a.m.,
6 before Jeffrey Benz, a Certified Realtime
7 Reporter, Registered Merit Reporter and Notary
8 Public within and for the State of New York.

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Calderone, Kenneth

May 9, 2024

3

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25

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Calderone, Kenneth

May 9, 2024

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1 **have been a small loss, I don't know which.**

2 Q. Would you regularly sell stocks in the
3 less than 30-day period in order to take a profit?

4 **A. I don't --**

5 MR. LAVELLE: Objection to form.

6 **A. I don't recall.**

7 Q. Setting aside this particular
8 transaction in AMD, was part of your strading --
9 trading strategy in 2021 to purchase stocks,
10 resell them within a period of a month or less, in
11 order to take profits?

12 MR. LAVELLE: Objection to form.

13 **A. Yes.**

14 Q. And why did you employ that strategy?

15 **A. I thought it was a good strategy.**

16 Q. And why did you think it was a good
17 strategy?

18 **A. Because I made money.**

19 Q. And how did you make money doing that?

20 **A. I sold at a profit.**

21 Q. So, in August of 2021, your trading
22 strategy was to purchase stocks, sell them within
23 a short period to take a profit?

24 MR. LAVELLE: Objection to form.

25 Misstates testimony.

Calderone, Kenneth

May 9, 2024

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1 [REDACTED]

2 [REDACTED]

3 A. Yes.

4 [REDACTED]

5 [REDACTED]

6 A. Yes.

7 [REDACTED]

8 [REDACTED]

9 [REDACTED]

10 [REDACTED]

11 [REDACTED]

12 [REDACTED]

13 [REDACTED]

14 [REDACTED]

15 [REDACTED]

16 Q. Why?

17 A. I had no reason.

18 [REDACTED]

19 [REDACTED]

20 [REDACTED]

21 [REDACTED]

22 [REDACTED]

23 [REDACTED]

24 [REDACTED]

25 [REDACTED]

Calderone, Kenneth

May 9, 2024

111

1 MR. LAVELLE: Same objections.

2 Q. It would not surprise you?

3 A. No.

4 Q. Why not?

5 A. I don't know. There's no reason
6 behind it.

7 Q. Is it fair to say you were regularly
8 buying and selling the same stocks in a short
9 period of time in July and August of 2021?

10 MR. LAVELLE: Objection to form.

11 A. It appears that I did, yes.

12 Q. And it appears that it did -- that you
13 did based on the records of your trades during
14 that period. Right?

15 MR. LAVELLE: Objection to form.

16 A. Yes.

17 Q. And do you know why you were regularly
18 buying and selling the same stock in short periods
19 in July and August of 2021?

20 A. No.

21 MR. LAVELLE: Objection to form.

22 Q. Well, were you trying to make money on
23 these stocks?

24 A. I'm sure I was.

25 MR. LAVELLE: Objection to form.

Calderone, Kenneth

May 9, 2024

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1 Q. Is that another stock you were invested
2 in?

3 A. Yes.

4 MR. LAVELLE: Objection to form.

5 Q. I'm just asking if that's the same
6 Palantir as the company you were invested in in
7 2021.

8 A. I believe so.

9 Q. If you go down to the bottom of that
10 page, there's a description of Palantir
11 Technologies with the stock ticker "PLTR."

12 Do you see that?

13 A. Yes.

14 Q. Is that the company you were invested
15 in?

16 A. Yes.

17 Q. We talked a little bit earlier about
18 Robinhood, the company that you invested in in
19 2021.

20 Do you recall that?

21 A. Yes.

22 Q. And you mentioned it in the context of
23 that movie. Do you know if Robinhood is a meme
24 stock?

25 A. I do now, yes.

Calderone, Kenneth

May 9, 2024

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1 Q. And it is a meme stock?

2 A. Yes.

3 Q. What about Novavax?

4 A. No.

5 Q. Do you know whether Novavax is a meme
6 stock -- meme stock?

7 A. No.

8 MR. CAMPBELL: Let's mark this as
9 Exhibit 4.

10 (Article dated March 4, 2024, from
11 InvestorPlace from Nasdaq.com, entitled The
12 Short List: 3 Meme Stock Battlegrounds to
13 Keep on Your Radar, was marked Calderone
14 Exhibit 4 for identification, as of this
15 date.)

16 Q. This is an article dated March 4, 2024,
17 from InvestorPlace.

18 Do you know where -- what InvestorPlace
19 is?

20 A. No.

21 Q. This is from a website called
22 nasdaq.com.

23 Do you know nasdaq.com?

24 A. No.

25 Q. The title of the article is, The Short

Calderone, Kenneth

May 9, 2024

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1 to put together this document, Exhibit 7, versus
2 the previous document, Exhibit 6?

3 A. I can tell you that with 6, I had --
4 those thousand shares still stayed, so I think
5 there was a -- a typo or some kind of error in the
6 500 that shows on 7/26/21 for 500 shares.

7 Q. Okay. Well, let's look in a little more
8 detail.

9 So this shows an initial purchase of
10 1,000 shares of Cassava stock on June 24, 2021.
11 Is that right?

12 A. Yes.

13 Q. So that's more than \$83,000 worth of
14 stock. Is that right?

15 A. Yes.

16 Q. Why did you buy \$83,000 worth of Cassava
17 stock in June of 2021?

18 A. I was listening to this guy, Sam, and
19 this stock just -- just stuck out to me that this
20 could be a game changer for people with
21 Alzheimer's, and I -- previously I said I lost my
22 mother, so I -- I wanted to -- I wanted to get
23 involved and purchase the stock.

24 Q. Who's Sam?

25 A. I don't know his last name, but it --

Calderone, Kenneth

May 9, 2024

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1 he's called SmartTrader, Sam SmartTrader.

2 Q. Is this somebody you know personally?

3 A. No.

4 Q. Was this somebody you listen to, like a
5 podcast?

6 A. Yeah. Yes.

7 Q. Is it called the SmartTrader podcast?

8 A. I don't know if it's SmartTrader
9 podcast. It's SmartTrader. I don't listen to it
10 anymore. I don't recall.

11 Q. Is there a Web site, SmartTrader?

12 A. I think there is. I think you can find
13 it on maybe Twitter or Stocktwits.

14 Q. When you say you would listen to Sam,
15 how would you listen to Sam?

16 A. He does like a -- a 20-minute warmup
17 where he talks about stocks, and where they're
18 going, and what they mean. But he doesn't -- you
19 know, obviously he -- he doesn't encourage you to
20 buy stocks. This is all of -- his opinion.

21 And he mentioned about Simufilam and
22 what Cassava Science was doing that, you know, if
23 they can -- if they're able to cure -- find a cure
24 for Alzheimer, that's -- that's a game changer.

25 And at that time, it -- it sounded like

Calderone, Kenneth

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1 all positive results about the company.

2 Q. Is this like something you would load on
3 your phone and listen to? A video on a website?
4 How would you --

5 A. No, it was -- well, my wife was -- was
6 listening. She -- she's -- listens to some of
7 those bloggers and whatnot, and I -- I was in --
8 in her -- her trading room, and I was listening to
9 her. She -- she day trades.

10 Q. Your wife day trades?

11 A. Not -- not so much now as she did back
12 then.

13 Q. So in the summer of 2021, your wife was
14 day trading?

15 A. Yes.

16 Q. And what -- does she day trade in her
17 retirement account?

18 A. No, she has a small Fidelity account, I
19 believe -- no. Charles Schwab.

20 Q. And are you a joint owner of that
21 account?

22 A. I don't think I am on that account.

23 [REDACTED]

24 [REDACTED]

25 [REDACTED]

Calderone, Kenneth

May 9, 2024

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1 [REDACTED]

2 [REDACTED]

3 Q. In that Charles Schwab account, do you
4 know if your wife day traded Cassava stock?

5 A. I don't know what she traded.

6 Q. But she would listen to the SmartTrader
7 podcast talking about Cassava stock?

8 MR. LAVELLE: Objection to form.

9 A. Yeah -- yes. My wife also does not like
10 high-risk stocks. She told me to be very cautious
11 with Cassava. So I had stop-losses on that stock.

12 Q. So Cassava was a high-risk stock?

13 A. She said, "Be careful. It's a high-risk
14 stock."

15 Q. Did you agree with her it was a
16 high-risk stock?

17 A. I wouldn't know what a high-risk stock
18 is. I -- but I trust my wife's value, which is
19 good. She's a smart woman.

20 Q. So would you always put a stop-loss on
21 your Cassava trades?

22 A. Yes.

23 Q. And to be clear, because I'm not sure I
24 caught the answer to this, do you know whether
25 your wife traded in Cassava stock?

Calderone, Kenneth

May 9, 2024

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1 A. She wouldn't touch the stock; she
2 doesn't touch bio stocks.

3 Q. Why does she not touch bio stocks?

4 A. She doesn't -- she doesn't trust them.

5 Q. Do you know why she doesn't trust bio
6 stocks?

7 A. No.

8 Q. When you say "a bio stock," what are you
9 referring to?

10 A. Anything in the -- anything to do with
11 biology, that a company is involved with making
12 medicines or something that can help -- help the
13 human race.

14 Q. So would you listen to the Sam
15 SmartTrader -- is it a podcast?

16 A. I don't know what it is.

17 Q. Okay.

18 A. I don't listen to it; my wife listens to
19 it. I so happened to be in the room that day
20 that -- and it piqued my interest in the stock,
21 but I -- yeah. I don't -- I don't listen to the
22 guy. I don't -- I don't even know if my wife
23 listens to him because that's a fee for listening,
24 and it's a lot.

25 Q. Okay. So it's a subscription?

Calderone, Kenneth

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1 Q. Okay. So what do you recall hearing
2 from Sam SmartTrader?

3 A. I just remembered him talking about
4 Cassava Science, the drug that they -- Simufilam,
5 that had really -- it had really good potential to
6 be something. That's what I remember.

7 Q. Did you do any additional diligence
8 before purchasing the \$83,000 in Cassava stock?

9 A. No, I did not.

10 Q. So you hear the podcast that -- how long
11 was it before you bought the stock?

12 A. It might have been a couple days. I
13 didn't buy it right then and there. But I -- I --
14 yeah. It would be a couple days after, I think.

15 Q. Did you talk to anyone about your plan
16 to purchase Cassava stock?

17 A. I spoke to my wife.

18 Q. And what did you tell her?

19 A. I said I'm thinking of purchasing
20 shares.

21 Q. Did you tell her how many?

22 A. No.

23 She just said, "Be careful."

24 So I said, "I'll put stop-losses on it."

25 Q. You didn't do any additional research

1 **A. I have to work.**

2 Q. But do you trade your stocks at night?

3 **A. No.**

4 Q. Well, then, by your definition, aren't
5 you a day trader?

6 **A. No, because some days when I traded, I**
7 **was off. I -- I worked remotely from home. And**
8 **if I wanted to trade at lunchtime or on a break, I**
9 **could do that.**

10 Q. I see. So, your view of a day trader
11 means somebody who is spending their day doing
12 stock trading?

13 **A. Correct.**

14 Q. Okay. Do you know whether day traders
15 typically enter and exit the same position on the
16 same day?

17 **A. No.**

18 Q. Okay. If the definition of day trading
19 was buying and selling the same stock during the
20 same day, would you be a day trader?

21 MR. LAVELLE: Objection to form.

22 **A. I don't know. I'm -- I don't know.**

23 Q. On July 9, did you buy and sell the same
24 stock on the same day?

25 **A. Yes.**

Calderone, Kenneth

May 9, 2024

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1 MR. LAVELLE: Objection to form.

2 Q. And on --

3 MR. LAVELLE: The amount.

4 It's a vague to whether you're referring
5 to the entire amount or just, you know,
6 the --

7 MR. CAMPBELL: Understood, understood.

8 Q. On July 9, 2021, did you buy 125 shares
9 of Cassava stock?

10 A. Yes.

11 Q. And on that same day, did you sell more
12 than a 125 days -- shares of Cassava stock?

13 A. Yes.

14 Q. On July 22, did you buy 1,000 shares of
15 Cassava stock?

16 A. Yes.

17 Q. And on July 22, did you sell
18 1,000 shares of Cassava stock?

19 A. Yes.

20 Q. And on July 23, did you buy 1,000 shares
21 of Cassava stock?

22 A. Yes.

23 Q. And on July 23, did you sell more than
24 1,000 shares of Cassava stock?

25 A. Yes.

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Calderone, Kenneth

May 9, 2024

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1 **A. Yes.**

2 Q. So we're talking about somewhere between
3 117 and \$130,000 worth of stock.

4 **A. Yes.**

5 Q. Why would you buy and sell \$130,000
6 worth of Cassava stock in one day?

7 **A. I don't know.**

8 [REDACTED]

9 [REDACTED]

10 [REDACTED]

11 [REDACTED]

12 [REDACTED]

13 [REDACTED]

14 [REDACTED]

15 Q. Do you recall how much you had invested
16 in equities in July of 2021?

17 **A. I don't recall.**

18 Q. Keep this handy, but I want to mark this
19 as Exhibit 8.

20 ([REDACTED] statement dated July 2021 was
21 marked Calderone Exhibit 8 for
22 identification, as of this date.)

23 Q. Do you recognize this?

24 **A. Yes.**

25 Q. This is your [REDACTED] statement for your

Calderone, Kenneth

May 9, 2024

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1 would go back into it, you know, let the money
2 clear, and reinvest in it.

3 Like I said, I had my stop-losses on it,
4 and, you know, I was just trying to be cautious
5 with the stock. I believed in the stock. But my
6 wife, you know, she's always, Be careful with it.

7 Q. And so your plan was to continue to buy
8 and sell chunks of Cassava stock going forward?

9 A. Yes.

10 Q. Okay. And buy and sell, essentially,
11 your entire position in the stock.

12 A. Yes.

13 Q. So you would -- your plan was to exit
14 your investment in Cassava entirely, and then
15 rebuy.

16 A. Not -- not --

17 MR. LAVELLE: Objection to form.

18 A. Yeah, not all the time. I did have some
19 shares. I wouldn't trade them all, I would keep
20 some of them.

21 Q. Okay.

22 Why?

23 A. I -- I don't -- I don't know why.

24 Q. So at the end of July, the last
25 transactions you enter are on July 26, 27, 28, and

1 would that constitute the 200 --

2 Q. Well, 500 minus --

3 A. Yes, yes, so -- so -- right. So I did
4 hold on to shares of the stock. I wouldn't trade
5 them entirely, so that's -- that's correct.

6 Q. Okay.

7 A. I -- I misspoke before. That's correct.

8 Q. Now it makes more sense that this might
9 be correct.

10 A. Yes, it does. Yes, it does.

11 Q. Okay. So you bought 500 shares on
12 July 26. Right?

13 A. Yes.

14 Q. And then you sold 400 shares on
15 the 27th. Right?

16 A. Yes.

17 Q. And then on the 28th, you sell, in
18 4 transactions, 150, plus 50, plus 100, plus 100,
19 is 400 shares; is that right?

20 A. Yes.

21 Q. Okay. And then on July 28, you buy
22 another 800 shares; is that right?

23 A. Yes.

24 Q. And then, if your stop-loss would have
25 taken effect on July 30, or whatever the next

Calderone, Kenneth

May 9, 2024

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1 business trading day is --

2 **A. Yes.**

3 Q. -- you would have exited your position
4 in Cassava?

5 **A. Yes.**

6 MR. LAVELLE: Objection to the form.
7 Misstates his testimony.

8 Q. I'm not looking to state your testimony,
9 I'm asking you right now --

10 **A. Yes.**

11 Q. -- on the next trading day after
12 July 29, would you have exited your position in
13 Cassava?

14 MR. LAVELLE: Objection to the form.

15 **A. Yes.**

16 Q. Okay. And you believe you had a
17 stop-loss in place?

18 **A. Yes.**

19 Q. So what happened on July 30, 2021?

20 **A. I woke up and saw a huge loss in
21 Cassava Science.**

22 Q. And is that the loss that caused your
23 damage in this case?

24 **A. Yes.**

25 Q. And what caused that damage?

Calderone, Kenneth

May 9, 2024

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1 Q. So the purchase price that you bought
2 those shares on July 26 and July 29, those are the
3 prices that you bought the stock that you
4 continued to hold on to, right?

5 A. Yes.

6 MR. LAVELLE: Objection to form.

7 Q. And that's what's reflected in
8 Exhibit 6; is that right?

9 A. Yes.

10 Q. Okay. After July 30, 2021, did the
11 stock price ever approach \$125 again?

12 A. I believe -- I believe it did.

13 Q. Could you have exited your position at
14 that point with no loss?

15 MR. LAVELLE: Objection to form.

16 A. Yes.

17 Q. Did you do so?

18 A. No.

19 Q. Why not?

20 A. Because I believed that Cassava re--
21 rebutted the claims, and I -- I still believed in
22 the stock. I held on to it.

23 Q. Setting aside whether Cassava had
24 rebutted the claims, if -- if none of this would
25 have happened at the end of July, and on July 30,

Calderone, Kenneth

May 9, 2024

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1 A. No. You know, I'm going to probably
2 hold on to the stock until it does what it does
3 because I believe in the stock. I'm in a
4 conundrum, you know. I -- I understand, I took a
5 huge loss, and that's on me.

6 But if what Cassava is stating, that the
7 drug does work, then, you know, I'm going to ride
8 it out.

9 Q. And that's why you still hold
10 1400 shares?

11 A. Yes, I still -- I still believe in this
12 stock.

13 Q. And that's why you continued to buy
14 stock in the company, even after filing the
15 complaint in this case.

16 A. I only bought three times. Just to cost
17 average down, just in case it -- it did have a
18 pop. I think -- I don't think I could stomach --
19 stomach this again. And I would get out if there
20 was a -- if there was big pop.

21 Q. Okay. So if the stock went up to
22 hundred dollars a share, you would sell out?

23 A. I would.

24 Q. And you think there's still a chance
25 that will happen?

Calderone, Kenneth

May 9, 2024

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1 A. Yes, I do. I think that it will go
2 higher. But, you know, we'll see what happens.

3 Q. And why do you think it will go higher?

4 A. I believe in -- I believe -- I believe
5 in the stock. I believe in what they're -- what
6 they're saying about the stock.

7 Q. Because you think the drug may work?

8 A. Yes.

9 Q. Okay.

10 MR. CAMPBELL: Take a break?

11 MR. LAVELLE: Sure.

12 THE VIDEOGRAPHER: Thank you. The time
13 is 1:54. We're going off the record. It's
14 the end of the Media 4.

15 (A recess was taken from 1:54 to
16 2:11.)

17 THE VIDEOGRAPHER: And the time is
18 approximately 2:11 p.m., we are back on the
19 record. It's the beginning of Media 5.

20 Q. Mr. Calderone, before we went on break,
21 we were discussing your transactions in Cassava
22 stock, in July of 2021.

23 Do you recall that?

24 A. Yes.

25 Q. And this is proximate to when you were

Calderone, Kenneth

May 9, 2024

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1 trading in the other stocks, the meme stocks that
2 we were talking about, earlier. Is that right?

3 MR. LAVELLE: Objection to form.

4 A. Yeah.

5 You call them meme. I guess everybody
6 calls them meme. I don't know, like, what to call
7 them.

8 Q. Just to clar-- just simplify things,
9 whether you would call them meme stocks or not,
10 the stocks that we were looking at in the articles
11 that were calling them meme stocks.

12 A. Correct.

13 Q. So stocks like DraftKings and Marathon
14 Digital holdings, and Fubo TV, you were trading
15 those stocks around the same time?

16 A. Yes.

17 Q. And also AMD; is that right?

18 A. Yes.

19 Q. Do you know approximately how much stock
20 in Cassava you bought in July of 2021?

21 A. In total?

22 In total over 130,000.

23 Q. Would it surprise you if you bought more
24 than \$315,000 in stock, Cassava stock, in July?

25 A. No. It wouldn't.

Calderone, Kenneth

May 9, 2024

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1 Q. In addition to the 80,000 in stock,
2 Cassava stock -- 83,000 you bought in June?

3 A. No, it wouldn't.

4 Q. So in total, you bought close to
5 \$400,000 of Cassava stock in a month.

6 A. Yes.

7 Q. Would it surprise you that you sold more
8 than \$420,000 in Cassava stock in July?

9 A. No.

10 Q. And indeed you said earlier, you made a
11 profit during the Cassava stock?

12 A. Yes, I did.

13 [REDACTED]

14 [REDACTED]

15 [REDACTED]

16 [REDACTED]

17 [REDACTED]

18 Q. And that profit that you made in July,
19 do you know how much it was?

20 MR. LAVELLE: Objection to form.

21 A. I would think -- I think it was about
22 44,000.

23 Q. So you made 44,000 on your trading in
24 Cassava stock in July. And then at the end of
25 July, you were still holding a thousand shares; is

Calderone, Kenneth

May 9, 2024

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1 that right?

2 **A. Yes.**

3 Q. So you did pretty well.

4 MR. LAVELLE: Objection to form.

5 **A. Yes.**

6 Q. And then you would have continued to
7 trade in Cassava stock after July 29, but it
8 dropped substantially in value over the next
9 couple days. Is that right?

10 MR. LAVELLE: Objection to form.

11 **A. I don't remember the timeframe when**
12 **those -- when it crashed, but yes, I -- I held on.**

13 Q. And my question is, you held on because
14 it fell substantially in value.

15 **A. Yes.**

16 MR. LAVELLE: Objection to form.

17 Q. And is that because you didn't want to
18 realize those losses?

19 **A. Yes.**

20 Q. Why not?

21 **A. Because I still thought that the stock**
22 **was -- was going to be something special.**

23 MR. CAMPBELL: Mark this as Exhibit 9.

24 (Document reflecting the stock values
25 for Cassava from July 19, 2021 through

Calderone, Kenneth

May 9, 2024

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1 August 16, 2021, was marked Calderone
2 Exhibit 9 for identification, as of this
3 date.)

4 Q. So to be very clear on what this
5 unmarked document is, this is me going to Yahoo
6 Finance, and pulling down the stock values for
7 Cassava from July 19 of 2021 through August 16 of
8 2021.

9 Does that make sense?

10 **A. Yes.**

11 Q. Okay. And if you look at July 29 of
12 2021, you can see that the stock had a high of
13 \$146.16 and a low of \$98.35 and closed at \$103.35.

14 Do you see that?

15 **A. Yes.**

16 Q. Does that accord with your recollection
17 of where the stock would have been on July 29,
18 2021?

19 MR. LAVELLE: Objection to form.

20 **A. I don't remember.**

21 Q. Okay. Well, when we look at your chart
22 on -- or your schedule of transactions, it says
23 that on July 29, 2021, you purchased 800 shares
24 for \$127.13. Is that right?

25 **A. Oh. What was the -- the number you were**

Calderone, Kenneth

May 9, 2024

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1 was a 69.53. Is that right?

2 **A. Yes.**

3 Q. So is that the crash you were
4 referencing?

5 **A. Yes.**

6 Q. So the stock did crash on July 30.

7 **A. Correct.**

8 Q. And that's why you didn't sell the
9 stock.

10 **A. Correct.**

11 Q. And then, over the course of all the
12 next two weeks or so, the stock price -- well,
13 first of all, let me ask, do you know why the
14 stock crashed on July 30?

15 **A. I think they -- Cassava received poor --**
16 **poor reviews on their B2 trials.**

17 Q. Where did you see that?

18 **A. Oh. I read about it. I heard about it.**

19 Q. So the crash in the stock on the day
20 after you bought it was not related to the
21 citizens' petition.

22 **A. No.**

23 Q. And over the -- it was related to test
24 results from Cassava?

25 **A. Yes.**

Calderone, Kenneth

May 9, 2024

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1 Q. Did you review those at the time?

2 A. No, I did not.

3 Q. Over the course of the next two weeks or
4 so, the stock rebounds back to a high of about
5 \$125 a share; is that right?

6 A. Yes.

7 MR. LAVELLE: Objection to form.

8 Q. And that's roughly the price at which
9 you bought the stock on July 26 and 29 that you
10 were holding?

11 A. Yes.

12 Q. So if you would have sold on
13 approximately those days, it was about a break
14 even?

15 A. Yes.

16 Q. Why didn't you sell?

17 A. I thought that the stock was -- was
18 going to do -- was still going to be something
19 special.

20 Q. And your testimony is, that if you had
21 had a stop-loss in place on the 29th that had been
22 during active hours trading, you would have sold
23 automatically at 8 percent less than \$127 a share,
24 right?

25 A. Yes, sir.

Calderone, Kenneth

May 9, 2024

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1 MR. LAVELLE: Objection to form.

2 A. Yes, sir.

3 Q. And 8 percent less than \$127 a share is
4 less than \$125 a share, right?

5 A. Yes.

6 Q. So if your stop-loss would have been
7 effectives, and I can do the math, but it's -- you
8 would have sold the stock at about 117, \$116 a
9 share; is that right?

10 MR. LAVELLE: Objection to form.

11 A. Yes.

12 Q. And you had opportunities later in
13 August to sell the stock for \$116 a share or more,
14 right?

15 A. Yes.

16 Q. But you chose not to do so?

17 A. Yes.

18 Q. Do you know why the stock came back up
19 to \$125 a share?

20 A. Cassava -- Cassava denied those -- those
21 claims about the -- the B -- the B2 analysis, and
22 then they -- they did a reanalysis, Dr. Wang, who
23 was -- who was -- who was a consultant for
24 Cassava, but was -- misled the shareholders, that
25 it was a lab that these results came from.

Calderone, Kenneth

May 9, 2024

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1 **know what else it could have been.**

2 Q. So going back to testimony, do you know
3 what caused the decline in stock value that caused
4 your losses?

5 **A. Yes.**

6 Q. What?

7 **A. The citizen's petition.**

8 Q. But you know the citizen's petition came
9 weeks after that decline?

10 **A. Yes.**

11 Q. So how could something that came weeks
12 after the decline cause the decline?

13 **A. With my stock loss? I'm getting the --**
14 **the days confused with when -- when my stock**
15 **tanked.**

16 Q. We've looked at the days --

17 **A. Yeah.**

18 Q. -- that your stock tanked, have we not?

19 **A. You know what? I can't -- I don't know.**
20 **I -- I don't know.**

21 Q. You purchased your shares on July 26th
22 and 29th, correct?

23 **A. Yeah.**

24 **Yes.**

25 Q. And the reason you suffered damages is

Calderone, Kenneth

May 9, 2024

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1 you didn't have a stop-loss in effect after hours
2 on July 29, correct?

3 **A. Yes.**

4 MR. LAVELLE: Objection to form.
5 Misstates his testimony.

6 Q. Is that correct?

7 **A. Yes.**

8 Q. Okay. And you don't know what caused
9 that drop in the stock value. Is that right?

10 **A. Correct.**

11 Q. But it was not the citizen's petition,
12 correct?

13 MR. LAVELLE: Objection to form.

14 **A. On the 30th of July? Yes.**

15 Q. Yes, it was not the citizen's petition?

16 **A. Yes.**

17 Q. And that's when you suffered your
18 losses, correct?

19 **A. Yes.**

20 Q. And for other dates or times, you had a
21 stop-loss in effect, correct?

22 MR. LAVELLE: Objection to form.

23 **A. Yes.**

24 MR. LAVELLE: Misstates his testimony.

25 Q. Since the complaint was filed in August

Calderone, Kenneth

May 9, 2024

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1 MR. LAVELLE: Objection to form.

2 A. No. It was the citizen's petition that
3 really was the nail in the coffin.

4 Q. But the citizen's petition wasn't a
5 thing in July of 2021. Right?

6 A. Yes.

7 Q. So it didn't cause a drop in the -- your
8 stock price --

9 A. No.

10 Q. -- on July 30, correct?

11 A. Correct.

12 Q. Okay. So, anything else you're aware
13 of, after the complaint was filed in August of
14 2022, that Cassava did to cause you damages?

15 A. Not that I can recall.

16 Q. And during that period subsequent to
17 August 2022, you, in fact, purchased additional
18 stock in Cassava, right?

19 A. Correct.

20 Q. We went through earlier when we were
21 looking at purchases, in September of 2022; is
22 that right?

23 A. Yes.

24 Q. So that was approximately one month
25 after the complaint was filed?

Calderone, Kenneth

May 9, 2024

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1 **A. Yes.**

2 Q. And then you bought additional stock in
3 May of 2023, another hundred shares; is that
4 right?

5 **A. Yes.**

6 Q. Have you made additional purchases of
7 Cassava stock since then?

8 **A. Yes.**

9 Q. What purchases have you made?

10 **A. From the -- the warrants, I bought an**
11 **additional 15 shares, and they gave me 30 shares,**
12 **something like that. I have 30 more shares from**
13 **the warrants.**

14 Q. Can you explain to me how that works?

15 **A. No. I don't know how it works.**

16 Q. Okay. How did you come to buy an
17 additional 15 that turned into 30 shares?

18 **A. I -- I don't know how -- I don't know**
19 **how it happened, but I wound up with 30 shares of**
20 **Cassava Science.**

21 Q. Did you pay for them?

22 **A. No.**

23 Q. Do you understand the process by which
24 you took ownership of those shares?

25 **A. No.**

Calderone, Kenneth

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1 record of a purchase of 100 shares of Cassava
2 stock on October 30.

3 Do you see that?

4 **A. Uh-huh. Yes.**

5 Q. Did you buy a hundred shares of Cassava
6 stock on October 30?

7 **A. Yes, I guess I did.**

8 Q. Do you know whether you did?

9 **A. Yeah, I -- I do because I'm looking at**
10 **the total based on the other sheets, and I have**
11 **1430. I think I even said that in the beginning**
12 **of the deposition. So that's -- my -- my math was**
13 **off. I was never good at math, but yes, that's**
14 **the hundred shares.**

15 Q. So, end of July, 2021, you had a
16 thousand shares. Is that right?

17 **A. Yes.**

18 Q. And then in September, you bought
19 another -- September of 2022, you bought another
20 200 shares after the complaint was filed, right?

21 **A. Yes.**

22 Q. And then May of 2023, you bought another
23 hundred shares. Is that right?

24 **A. Yes.**

25 Q. And that's how you got to 1300?

Calderone, Kenneth

May 9, 2024

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1 **A. Yes.**

2 Q. And then on October 30th of 2023, so
3 after the end of the new class period, you
4 purchased another hundred shares.

5 **A. Yes.**

6 Q. Why?

7 **A. Cost average down.**

8 Q. Do you have a strategy for cost
9 averaging down your Cassava Sciences stock?

10 **A. No, because there are times when I could**
11 **have purchased it even lower but didn't. I'm not**
12 **planning on buying any more stock in Cassava.**

13 Q. Any particular reason you bought this
14 hundred shares on October 30?

15 **A. No.**

16 Q. On October 31, there's a purchase of
17 another 25 shares.

18 Do you see that?

19 **A. Yes.**

20 Q. Did you make that purchase?

21 **A. Yes.**

22 Q. Why?

23 **A. No reason.**

24 Q. Did you think the stock was undervalued?

25 **A. In my opinion, I think the stock is**

Calderone, Kenneth

May 9, 2024

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1 **undervalued.**

2 MR. CAMPBELL: Mark this Exhibit 13.

3 (Account statement for December 2023

4 was marked Calderone Exhibit 13 for

5 identification, as of this date.)

6 Q. This is your account statement for

7 December of 2023; is that right?

8 **A. Yes.**

9 Q. And if you look on page 6 of 13, which
10 is SAVA_KC271, you see that?

11 **A. Yes.**

12 Q. It says that on December 27, 2023, you
13 bought another 5 shares in Cassava stock?

14 **A. Yes.**

15 Q. Is that accurate?

16 **A. Yes.**

17 MR. LAVELLE: Sorry, which page are you
18 on, Scott?

19 MR. CAMPBELL: 271.

20 MR. LAVELLE: Thanks.

21 MR. CAMPBELL: The bottom.

22 MR. LAVELLE: Got it.

23 Q. But why did you purchase those shares?

24 **A. Cost average down.**

25 Q. Any particular reason you bought it at

Calderone, Kenneth

May 9, 2024

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1 the end of December 2023?

2 **A. No.**

3 Q. Continue to think the stock was
4 undervalued?

5 **A. Yes.**

6 MR. CAMPBELL: That's all I have.

7 **A. That's it?**

8 MR. LAVELLE: I have no questions.

9 We can conclude the deposition.

10 THE VIDEOGRAPHER: May I close out the
11 deposition for today?

12 MR. LAVELLE: You may.

13 THE VIDEOGRAPHER: Thank you.

14 We are off the record. At 3:36 p.m.,
15 and this concludes today's testimony given by
16 Kenneth Calderone. The total -- the total
17 number of media used was six and will be
18 retained by Henderson Legal Services.

19 Thanks, everyone.

20 (Time noted: 3:36 p.m.)

21

22

23

24

25

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1 A C K N O W L E D G E M E N T

2

3

4 I, KENNETH CALDERONE, hereby certify, I have
5 read the transcript of my testimony taken under
6 oath in my deposition of May 9, 2024; that the
7 transcript is a true, complete and correct record
8 of what was asked, answered and said during this
9 deposition, and that the answers on the record as
10 given by me are true and correct.

11

12

13 _____
KENNETH CALDERONE

14 Subscribed and sworn to

15 before me on this _____ day

16 of _____, 2024

17

18 _____

19 NOTARY PUBLIC

20

21

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23

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25

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1 C E R T I F I C A T E

2

3 STATE OF NEW YORK)
4) Ss.:
5 COUNTY OF NEW YORK)

6

7 I JEFFREY BENZ, a Certified Realtime
8 Reporter, Registered Merit Reporter and Notary
9 Public within and for the State of New York, do
10 hereby certify:

11 That the witness whose examination is
12 hereinbefore set forth was duly sworn by me and
13 that this transcript of such examination is a true
14 record of the testimony given by such witness.

15 I further certify that I am not related to
16 any of the parties to this action by blood or
17 marriage and that I am in no way interested in the
18 outcome of this matter.

19 IN WITNESS WHEREOF, I have hereunto set my
20 hand this 20th of May, 2024.

21

22

23 JEFFREY BENZ, CRR, RMR

24

25

26

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EXHIBIT 5

Rao, Manohar K.

May 28, 2024

1

IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
AUSTIN DIVISION

In re CASSAVA :
SCIENCES INC. :
SECURITIES LITIGATION : Master File No.
: 1:21-cv-00751-DAE
This Document :
Relations to: : CLASS ACTION
ALL ACTIONS :

C O N F I D E N T I A L

VIDEOTAPED / REALTIMED DEPOSITION OF

MANOHAR K. RAO

MAY 28, 2024

Reported By:

Pat English-Arredondo,

CSR (TX), RMR, CRR, CLR

Henderson Legal Services

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Rao, Manohar K.

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2

1 VIDEOTAPED / REALTIMED DEPOSITION of
2 MANOHAR K. RAO, produced as a witness at the
3 instance of the Defendants, and duly sworn,
4 was taken in the above-styled and numbered
5 cause on Tuesday, the 28th day of May, 2024,
6 from 9:08 a.m. to 5:07 p.m. before Pat
7 English-Arredondo, CSR (TX), RMR, CRR, CLR,
8 in and for the State of Texas, reported by
9 machine shorthand in realtime translation, at
10 the law offices of Gibson, Dunn & Crutcher,
11 LLP, 811 Main Street, Suite 3000, Houston,
12 Texas, pursuant to the Federal Rules of Civil
13 Procedure; that the Witness will read the
14 deposition.

Rao, Manohar K.

May 28, 2024

3

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CERTIFIED STENOGRAPHIC / REALTIME REPORTER:

Ms. Pat English-Arredondo
CSR (TX), RMR, CRR, CLR

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Rao, Manohar K.

May 28, 2024

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1 EXAMINATION INDEX

2 WITNESS: MANOHAR K. RAO

3 EXAMINATION MR. TURQUET BRAVARD PAGE
8

4 SIGNATURE REQUESTED 373

5 REPORTER'S CERTIFICATION 375

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Rao, Manohar K.

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1	EXHIBITS	
2	NO.	DESCRIPTION PAGE
3	RAO EXHIBIT NO. 1	18
4	Plaintiffs' Responses and Objections to	
5	Defendant's First Set of Requests for	
6	Production of Documents, 37 pages	
7	RAO EXHIBIT NO. 2	23
8	Biography background on Manohar K. Rao,	
9	Bates SAVA_MR0000189-191	
10	RAO EXHIBIT NO. 3	64
11	Exhibit D, Declaration of Manohar K.	
12	Rao in Support of His Motion for	
13	Consolidation of Related Actions,	
14	Appointment as Lead Plaintiff, and	
15	Approval of Lead Counsel dated	
16	10-25-21, 4 pages	
17	RAO EXHIBIT NO. 4	122
18	Investment Reports, Bates	
19	SAVA_MR00000001 - 30	
20	RAO EXHIBIT NO. 5	157
21	Document titled "Compilation of Stock	
22	Charts (2021)," showing stock charts	
23	created and compiled by defense counsel	
24	by clipping stock charts of various	
25	stocks using date range 12-1-20 to	
	1-31-22, 8 pages	
	RAO EXHIBIT NO. 6	173
	Investment Reports, Bates	
	SAVA_MR000000031 - 66	
	RAO EXHIBIT NO. 7	174
	Investment Reports, Bates	
	SAVA_MR000000067 - 100	
	RAO EXHIBIT NO. 8	223
	SAVA Stock Historical Prices & Data,	
	Yahoo Finance, 13 pages	

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1	RAO EXHIBIT NO. 9	223
2	Exhibit C, Sworn Certification of	
3	Plaintiff, Cassava Sciences, Inc.	
4	Securities Litigation, dated 8-16-22,	
5	11 pages	
6	RAO EXHIBIT NO. 10	274
7	Exhibit C to Rao's Motion for	
8	Consolidation in subject case, 14 pages	
9	RAO EXHIBIT NO. 11	332
10	Citizen Petition written by Labaton	
11	Sucharow dated 8-18-21 to FDA, 3 pages	
12	RAO EXHIBIT NO. 12	358
13	Letter dated 10-24-21 to M. Rao from	
14	Robert Prongay of Glancy, Prongay &	
15	Murray, Bates SAVA_mr00000192-193	

12 (REPORTER'S NOTE: All quotations from
13 exhibits are reflected in the manner in which
14 they were read into the record and do not
15 necessarily denote an exact quote from the
16 document.)

Rao, Manohar K.

May 28, 2024

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1 before you ever made a trade?

2 A. Before I made a decision.

3 Q. Okay. Do you recall what your
4 first options trade was?

5 A. No, I don't. 10:36

6 Q. Okay. When you educated
7 yourself about options, you spent that one or
8 two years educating yourself about
9 options --

10 A. Uh-huh. 10:36

11 Q. -- what did you learn about
12 when to buy an option, what makes an option
13 attractive?

14 [REDACTED]
15 [REDACTED] 10:37
16 [REDACTED]
17 [REDACTED]
18 [REDACTED]
19 [REDACTED]

20 [REDACTED] 10:37
21 [REDACTED]
22 [REDACTED]

23 [REDACTED]
24 [REDACTED]
25 [REDACTED] 10:37

Rao, Manohar K.

May 28, 2024

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1

[REDACTED]

2

[REDACTED]

3

[REDACTED]

4

[REDACTED]

5

[REDACTED]

10:37

6

[REDACTED]

7

[REDACTED]

8

Q. Okay.

9

A. That's --

10

Q. And then when you say "buy an

10:38

11

option," you were buying puts, you said?

12

A. I'm selling puts.

13

MR. FALLON: Object to form.

14

Q. (By Mr. Turquet Bravard)

15

Selling puts?

10:38

16

A. Yeah.

17

[REDACTED]

18

[REDACTED]

19

[REDACTED]

20

[REDACTED]

10:38

21

[REDACTED]

22

[REDACTED]

23

Q. Okay. And then when did you

24

determine -- I'm sorry. Strike that.

25

How would you determine when to

10:38

Rao, Manohar K.

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1 studies that are purported to support
2 simufilam's efficacy as a drug for the
3 treatment of Alzheimer's?

4 A. I'm familiar with the tests
5 that they have done in a lab, which is a CUNY 01:44
6 lab where I know they...

7 And that's basically
8 -- apparently it's related to the --
9 Dr. Wang, I guess, that the lab had tested
10 the simufilam. 01:44

11 And the results that came out
12 of that lab, that's what I understood
13 to -- and then -- and then they published
14 them and they basically said the results
15 are -- the phase will be, what is phase. And 01:45
16 then they said, Praise be. The results look
17 very good.

18 And then they published the
19 data and the drug became -- they rave and the
20 FDA has approved, even though there were 01:45
21 certain objections people had it during that
22 phase, including some of the FDA directors
23 had some objections.

24 But finally, when the drug
25 became -- that was experiments were 01:45

Rao, Manohar K.

May 28, 2024

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1 Q. And, again, your expiration
2 date is ten days out. Correct?

3 A. Ten days out.

4 Q. You sold these because you felt
5 you could get a reasonable premium on them. 02:23
6 Correct?

7 [REDACTED]
8 [REDACTED]
9 [REDACTED]
10 [REDACTED] 02:23

11 [REDACTED]
12 [REDACTED]
13 [REDACTED]
14 [REDACTED]
15 [REDACTED] 02:23

16 [REDACTED]
17 [REDACTED]
18 [REDACTED]
19 [REDACTED]
20 [REDACTED] 02:23

21 Q. Do you know how the stock
22 was -- or the price of Cassava stock was
23 trending at this time in July 2021?

24 A. No, I don't -- I don't really
25 remember at that time. 02:23

Rao, Manohar K.

May 28, 2024

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1 backwards. Okay. I see.

2 July 30, the first line is

3 price, "8785."

4 THE REPORTER: 87, point, 85?

5 THE WITNESS: Yeah. 03:26

6 Q. (By Mr. Turquet Bravard) And
7 where does this -- where did the stock price
8 close on that day, July 30, 2021?

9 A. \$69.

10 Q. And -- 03:26

11 A. 69.53.

12 Q. And that was two days after you
13 had sold the same stock at \$140 a share
14 correct?

15 A. Absolutely. And I don't know 03:26
16 what news brought that thing, but I was so
17 fortunate to sell it at 135.

18 Q. Would you assume that it was
19 some sort of news that caused that decrease?

20 A. It is -- 03:26

21 MR. FALLON: Object to form.

22 Q. (By Mr. Turquet Bravard) You
23 can answer.

24 A. It is possible. I mean, it is.

25 I do not know which news caused it and maybe 03:26

Rao, Manohar K.

May 28, 2024

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1 it before you say anything.

2 **A. Uh-huh.**

3 Q. The first transaction you
4 bought 20,100 shares for \$91 a share.

5 Correct? 04:02

6 **A. Okay.**

7 Q. Is that correct?

8 **A. If it's at 20,000, the math
9 doesn't work here; so that's a problem.**

10 Q. How so? 04:02

11 **A. It says 20,100 -- oh, you mean
12 there's no total amount. Okay. Never mind.
13 Yeah, you're right. It shows I bought it,
14 but it doesn't say how much money.**

15 Q. I'm going to reask just for the 04:02
16 record.

17 **A. Yeah.**

18 Q. So on August 30, 2021 you
19 bought 20,100 shares in Cassava stock at \$95
20 a share. Correct? 04:02

21 **A. That is correct.**

22 Q. And you bought those because
23 you were assigned 201 puts. Correct?

24 MR. FALLON: Hold on.

25 Please let him finish. 04:03

Rao, Manohar K.

May 28, 2024

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1 MR. FALLON: Object to form.

2 THE REPORTER: What was your
3 answer? I didn't get your answer.

4 **A. Sorry. Repeat.**

5 Q. (By Mr. Turquet Bravard) You 04:04
6 don't know why the stock price dropped to
7 this level, \$52 a share --

8 **A. No, I do not.**

9 MR. FALLON: Hold on. Same
10 objections. 04:04

11 Q. -- on August 30, 2021.
12 Correct?

13 MR. FALLON: Same objections.

14 **A. Yeah, I do not recall what**
15 **happened, yeah.** 04:04

16 Q. (By Mr. Turquet Bravard) Do
17 you know why you purchased 400 shares on this
18 date?

19 **A. 400 shares? No, I don't**
20 **recall. I mean, I just bought -- well, 2,000** 04:04
21 **was assigned. But, no, I don't recall.**

22 Q. And then do you see the same
23 day, on August 30, 2021, you sold 7,860
24 shares in Cassava stock for \$53.74 a share?

25 **A. Uh-huh.** 04:05

Rao, Manohar K.

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1 Q. Do you see that?

2 A. Yes, I see that.

3 Q. And then the same day you also
4 sold 12,240 shares of Cassava stock for 53.63
5 a share.

04:05

6 Do you see that?

7 A. Uh-huh.

8 Q. So is it fair to say you took a
9 significant loss on this sale?

10 A. The numbers? I bought it 04:05
11 for -- let's see. It looks like a loss here.
12 I'm trying to see how much I bought it for,
13 I guess.

14 MR. FALLON: I would like to
15 object to that question. You can go 04:05
16 ahead and continue your answer.

17 THE WITNESS: Okay.

18 A. I do not know what the reason
19 that dropped, because it looks like -- to me,
20 it looks, I mean, it looks like I was 04:06
21 thinking that this was going to go down
22 forever and that I would lose all of it.

23 That's how I feel like. But
24 that may not be the reason, but I don't know
25 exact reason what -- what happened to make me 04:06

Rao, Manohar K.

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1 omitted -- sorry.

2 **A.** Oh, let me see. I bought and
3 **sold and the difference -- is it 400? I'm**
4 **trying to think. 20,100 and 7,000, if I**
5 **calculate that. No, I don't see that kind of 04:46**
6 **dat. I can't see it.**

7 Q. Not a big deal. I just --
8 let's focus on that. Let's focus on that
9 purchase of 20,100 shares of Cassava stock on
10 August 30, 2021. 04:46

11 Do you see that one?

12 **A.** **Yes, I see that.**

13 Q. That's the assignment.
14 Correct?

15 **A.** **Yes, that's the -- 04:46**

16 MR. FALLON: Asked and
17 answered.

18 Q. And the total for that purchase
19 was \$1,909,500. Correct?

20 **A.** **That is correct. 04:46**

21 Q. Now, that is almost your entire
22 investment portfolio at this time. Correct?

23 **A.** **Right.**

24 Q. So holding that is extremely
25 risky. Correct? 04:46

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2 MR. FALLON: Object to form.

4 mean, you mentioned earlier --

6 Q. -- maybe you sold because you
7 needed the money. I'm wondering --

12 Q. You don't recall?

14 Q. No problem. All right. You
15 can put that aside. I want to switch topics. 04:47
16 When did you make the decision
17 to file this lawsuit?

24 Q. And how did you hear about
25 that?

Rao, Manohar K.

May 28, 2024

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1 In re CASSAVA SCIENCES INC.
 2 SECURITIES LITIGATION
 3 C O N F I D E N T I A L
 4 VIDEOTAPED / REALTIMED DEPOSITION OF
 5 MANOHAR K. RAO
 6 MAY 28, 2024

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May 28, 2024

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1 _____
 2 _____
 3 _____
 4 _____
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 6 _____

7
 8 I, MANOHAR K. RAO, have read the
 9 foregoing deposition and hereby affix my
 10 signature that same is true and correct,
 11 except as noted above.

11 _____
 12 MANOHAR K. RAO

12 THE STATE OF _____:
 13 COUNTY OF _____:

14 BEFORE ME, _____,
 15 on this day appeared MANOHAR K. RAO, known to
 16 me or proved to me on the oath of
 17 _____ or through
 18 _____ [description of identity
 19 card or other document] to be the person
 20 whose name is subscribed to the foregoing
 21 instrument and acknowledged to me that they
 22 executed the same for purposes and
 23 consideration therein expressed.

19 Given under my hand on this
 20 _____ day of _____, 2024.

21
 22 Notary Public in and for the
 23 State of _____
 24 My commission expires: _____

25 Job No: 55454

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May 28, 2024

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1 IN THE UNITED STATES DISTRICT COURT
2 FOR THE WESTERN DISTRICT OF TEXAS
3 AUSTIN DIVISION

3 In re CASSAVA :
4 SCIENCES INC. :
5 SECURITIES LITIGATION : Master File No.
6 : 1:21-cv-00751-DAE
7 This Document :
8 Relations to: : CLASS ACTION
9 ALL ACTIONS :

7 CONFIDENTIAL
8 REPORTER'S CERTIFICATION TO THE
9 VIDEOTAPED / REALTIMED DEPOSITION OF
10 MANOHAR K. RAO
11 MAY 28, 2024

10 I, Pat English-Arredondo, CSR, RMR,
11 CRR, CLR, Certified Shorthand Reporter in and
12 for the State of Texas, hereby certify to the
13 following:

14 That the witness, MANOHAR K. RAO, was
15 duly sworn by the officer and that the
16 transcript of the oral deposition is a true
17 record of the testimony given by the witness;

18 I further certify that pursuant to FRCP
19 Rule 30(f)(1) that the signature of the
20 deponent:

21 __X__ was requested by the deponent or a
22 party before the completion of the deposition
23 and returned within 30 days from date of
24 receipt of the transcript. If returned, the
25 attached Changes and Signature Page contains

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May 28, 2024

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1 any changes and the reasons therefor;
2 _____ was not requested by the deponent or a
3 party before the completion of the
4 deposition.

5 I further certify that I am neither
6 counsel for, related to, nor employed by any
7 of the parties or attorneys in the action in
8 which this proceeding was taken, and further
9 that I am not financially or otherwise
10 interested in the outcome of the action.

11 Certified to by me this 4th day of May,
12 2024.

13

14

15

16

17

18

Pat English-Arredondo
Pat English-Arredondo,
CSR (TX), RMR, CRR, CLR
Texas CSR 3828
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EXHIBIT 6

Meme Stocks Frenzy

Reignites Debate Over Market Integrity

Dan Irvine Contributor

I analyze market events and their influence on investment strategies.

Follow

Updated May 15, 2024, 01:40pm EDT

May 15, 2024, 08:13am EDT



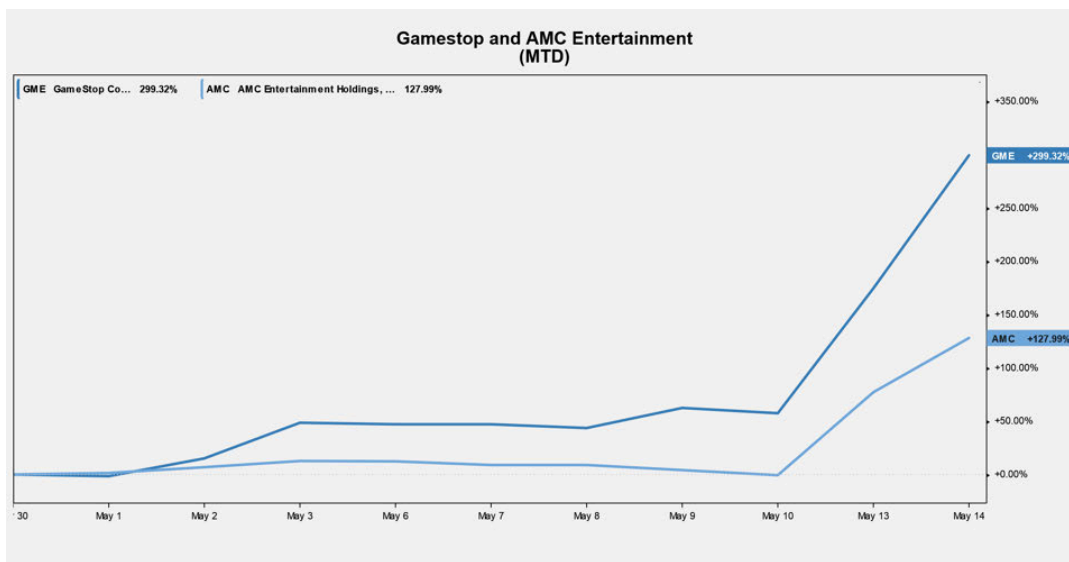
On May 10th, large volumes of deep out-of-the-money GameStop options were purchased.

(Photo ... [+] SOPA IMAGES/LIGHTROCKET VIA GETTY IMAGES

GameStop and AMC Entertainment

GameStop 0.0% and AMC Entertainment 0.0%, cornerstones of the 2021 frenzy, have once again witnessed a meteoric rise in their share prices. So far in May, GameStop and AMC's prices have risen by 283% and 137%, respectively.

Has anything changed with their respective businesses? No, not really. They may have even further deteriorated, despite having plenty of cash as they take advantage of their nonsensical share prices to issue more shares.



GameStop and AMC Entertainment (MTD) KOYFIN

To comprehend the current meme stock frenzy, it is essential to revisit the events of 2021. GameStop, a struggling video game retailer, and AMC, a movie theater chain then grappling with the pandemic's impact, unexpectedly found themselves at the epicenter of a trading revolution.

Fueled by online communities and social media platforms, a collective of rogue retail traders banded together to drive up the share prices of these companies, defying conventional market wisdom. By leveraging platforms like Reddit's WallStreetBets forum, traders shared investment strategies, rallied support, and executed a coordinated buying spree that sent shockwaves through Wall Street.

Investing Digest: Know what's moving the financial markets and what smart money is buying with Forbes Investing Digest.

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The resurgence of meme stocks has reignited debates surrounding market manipulation and the need for regulatory oversight. While the coordinated buying efforts of retail traders may not be inherently illegal, concerns have been raised about the potential for such activities to distort market dynamics and undermine fair and efficient price discovery mechanisms.

Market Manipulation Concerns

not rise by approximately 15% and a whopping 72%, respectively, by the close of that day.

What would cause investors—or, more accurately, speculators—to make such large short-term bets on a wildly improbable outcome? Coordination. This type of trading has all the hallmarks of a pump-and-dump scheme, but the mechanics of how it is taking place are gray zones in terms of market regulation.

Regulators, such as the U.S. Securities and Exchange Commission, have been closely monitoring the meme stock phenomenon, seeking to strike a balance between protecting investors and preserving market integrity. However, the complexities of social media-driven trading and the rapidly evolving nature of online communities pose significant challenges for regulatory bodies.

The Allure Of Quick Gains

As bystanders watch some call option buyers getting rich with returns in the thousands of percent on short-term trades, and the trading activity not necessarily illegal, it might seem tempting to jump in and take a shot at benefiting from this wild market activity. Also, this is the second time such an event has happened around these stocks, further enticing speculators into the market.

At its core, the meme stock phenomenon taps into the age-old human desire for quick and substantial returns on investment. The prospect of capitalizing on coordinated buying efforts and triggering a short squeeze, a situation where short-sellers are forced

y

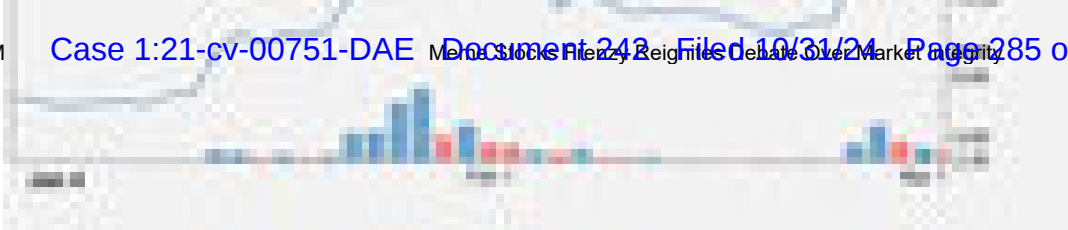
fostered by online forums, coupled with the desire for contribution against perceived injustices or establishment figures, has fueled the emotional investment in meme stocks.

The us-versus-them narrative, pitting retail traders against institutional investors and short-sellers, has created a mighty rallying cry transcending purely financial motivation. This psychological dimension adds an intriguing layer to the meme stock phenomenon, underscoring the complex interplay between human emotions and investment decisions.

Market Disruption And Systemic Risk

For all traders hitting it big, there are likely many more who will zero out investments and sometimes entire investment accounts chasing the unicorn trade. As we know, with all short squeezes, they can reverse as quickly as they appear. Timing is everything, and buying into a short squeeze is usually too late. The options purchased run out of time to be in the money by expiration, and often, the short squeeze reverses, resulting in massive daily losses on long-call option positions.

When meme stocks rally to extreme highs, the rapid fall in price is almost always just as spectacular. GameStop in 2021 demonstrated what happens when the pump-and-dump winners begin the dump phase of the trade; the late speculators get wiped out.



GameStop (January - February 2021) KOYFIN

Amid the frenzy surrounding meme stocks, it is essential to remember the importance of fundamentals and long-term investment strategies. While the allure of quick gains may be tempting, seasoned investors and financial advisors often caution against speculative trading and emphasize the value of diversification, risk management, and focusing on companies with sound business models and growth prospects.

By their very nature, meme stocks are driven by sentiment and hype rather than underlying fundamentals, making them inherently risky investments. Knowledgeable investors are advised to remain focused on fundamentally sound, long-term investment strategies and view the meme stock phenomenon as a temporary distortion in market dynamics.

As the meme stock saga unfolds, it remains to be seen whether this resurgence will be a fleeting phenomenon or a harbinger of more profound changes in market dynamics. The interplay between social media, retail trading, and traditional investment practices is likely to shape the future of financial markets in difficult-to-predict ways.

Regardless of the trajectory, knowledgeable investors should remain focused on fundamentally sound, long-term investment strategies and leave the pump-and-dump schemes to the internet chatroom traders.

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Dan Irvine

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EXHIBIT 7

June 8, 2021, 1:15 PM PDT

Drugmaker With No Product Gains 911% on Alzheimer's, Meme Hopes

Cristin Flanagan
Bloomberg News

- Cassava's stock rise this year trails only AMC, GameStop
- Update on Alzheimer's disease tablet is expected in July

Cassava Sciences Inc., a drugmaker with no products on the market after 20 years, is the top biotech performer in 2021 with an increase of 911%.

Behind this meteoric rise is a combination of optimism for its early-stage Alzheimer's drug and the frenzy of retail day trading that has characterized the pandemic. The company is the third biggest gainer this year behind GameStop Corp. and AMC Entertainment Holdings Inc. in the Russell 2000.

"The fundamentals of our story are in place, which is this is the first drug -- to our knowledge -- that can restore cognition," Cassava's founder and chief executive **Remi Barbier** said in an interview.

The latest boost came from an unlikely source -- its rival Biogen Inc. -- whose own Alzheimer's treatment this week got the green light from the Food & Drug Administration. The approval drove the price of Cassava and other small biotechs higher alongside Biogen. Cassava rose as much as 8.4% on Tuesday before closing at \$68.96 for a 2% gain.

Read more: Biogen's FDA Victory Changes the Game for Alzheimer's Drugs

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GameStop Corp

AMC Entertainment Holdings Inc

Biogen Inc

Wild Ride

Cassava hit 20-year high in February on Alzheimer's disease results



Wall Street firms covering Cassava are unanimously bullish. **Soumit Roy** of JonesTrading, who has the highest price target at \$110, estimates new medicines to tackle Alzheimer's could generate \$200 billion in sales over 15 years. Still, Roy has cautioned that Cassava, an Alzheimer's pure-play, is "not for the faint of heart."

A biotech plus the meme stock crowd is a combustible mix. Drugmakers that have treatments still in early trials can be highly volatile while stocks like AMC and Gamestop have had their own share of price swings.

"We're a moonshot with one rocket ship," Barbier acknowledged.

Unlike other top brass, Barbier isn't playing to the newfound army of small investors. "We have a core group of institutional investors who have seen the data, done their homework and said 'Wow -- if this data replicates this is the next fill-in-the-blank, Google or Tesla.'"

Mid-Stage Trial

Cassava reached levels not seen in 20 years in February following an update from an ongoing mid-stage trial. Alzheimer's patients getting the company's wholly owned experimental tablet, called simufilam, showed improvement in reasoning and behavior. But the trial was with less than 100 patients and without a control arm to gauge the impact a placebo might have had on patients.

If the Austin, Texas-based company is able to show patients with mild-to-moderate Alzheimer's are able to maintain the same level of cognition they started with at nine months, "that would be a win," Roy said in an interview. The most bullish case would be if patients were able to show an actual improvement in scores that measure their comprehension.

Monday's approval substantially lowers the the bar for new drugs targeting Alzheimer's, according to Barbier. Biogen's drug had mixed results in clinical trials and faced skepticism from some scientists. For it to remain on the market, Biogen needs to do more research.

"FDA is asking Biogen to eventually show evidence of efficacy in a real-world setting," Barbier said.

Cassava, for its part, still remains years away from regulatory approval. The company would need to run large placebo controlled studies -- the gold standard of clinical trials -- which Barbier said it plans to start in the latter half of the year.

Even so, the many setbacks Biogen's aducanumab has faced highlight the complicated road to regulatory acceptance. But for small investors looking to capitalize on that hope, Cassava at roughly \$70 a share and a handful of other small biotechs look like attractive gambles.

Read more: Biogen Hopes Alzheimer's Drug Mired in Controversy Earns FDA Nod

Drugmaking juggernauts like Eli Lilly & Co. and Roche Holding AG have also been testing treatments similar to Biogen's, but Cassava's drug targets a different protein and it's likely the only biotech pursuing this pathway.

Before Monday's approval Barbier expressed hope for Biogen's drug, "just because there's nothing out there for patients. But, it's not the be all end all." In another decade there may be several new drugs on the market, he said. "It's not a winner takes all situation," according to Barbier.

Pain Therapeutics

Long-time biotech investors may remember Cassava by a different name, Pain Therapeutics Inc. In 2000, the company was a **Bill Gates**-backed initial public offering that was banking on the promise of a new generation of painkillers. The company threw in the towel on its painkiller dreams in 2019, changed its name to Cassava, and refocused on Alzheimer's and other neurodegenerative diseases.

Despite a stock rally that makes his 5% stake -- including options -- worth more than \$100 million, Barbier says he's not selling. "I know the science, I know the data, I know the disease and this stuff looks promising and I'm putting my money where my mouth is."

(Updates with closing prices throughout)

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Nicole Bullock, Vivianne Rodrigues

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EXHIBIT 8

June 11, 2021, 1:15 PM PDT

Biotech Finds Market Love at Last as Meme Traders, FDA Converge



Cristin Flanagan
Bloomberg Editorial



- Biogen's treatment for disease approved despite mixed trials
- Heavily shorted shares draw the interest of retail investors

By Cristin Flanagan

(Bloomberg) --

Unloved biotech stocks posted the best week since November, fueled by a controversial regulatory decision and a legion of Reddit fans, burning a bunch of short sellers along the way. Now investors are taking a second look at the sector.

With biotech having trailed the broader market for the past three months and chock full of companies that have been the focus of short sellers, it was catnip for the Reddit crowd. Indeed, the price action wrought havoc across the health-care sector after shorts lost over \$465 million on Clover Health Investments Corp. in a single day as the stock nearly doubled.

The moves weren't just about amateur traders or punishing the shorts. Specialists who live and breathe biotech received two of three critical updates that have been hailed as the impetus for a broad return of investor interest. That includes approval from the Food and Drug Administration of an Alzheimer's disease drug from Biogen Inc.

"One of the clouds overhanging the sector went away this week, it's a very good sign," Brad Loncar, chief executive officer of Loncar Investments, said of the FDA decision.

Seeking Salvation Health-care ETFs gain ground after missing out on broader market rally



Source: Bloomberg

Monday's decision by the FDA to approve Aduhelm, the first new medicine for the disease in decades, came despite mixed clinical trials, stunning analysts and buoying the sector. More than 15 million shares in the \$11 billion iShares Nasdaq Biotechnology ETF (IBB) changed hands, the highest daily level since June 2017. The index ended the week up 6%.

It wasn't all good news for these drugmakers. Aduhelm's \$56,000 a year price tag and a setback for Vertex Pharmaceuticals Inc. tempered the rally. The cost of the Biogen drug renewed concern about a regulatory clampdown on pricing, while Vertex announced that it had halted development of a liver disease treatment that the company said was unlikely to have a clinical benefit for patients. Shares of the drug developer plunged 11% on Friday and it's the worst performer among large-cap biotech, falling 18% so far this year.

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There's one more key readout biotech investors are waiting on: results from a trial in major depression from Biogen and its partner Sage Therapeutics Inc. With a win for Biogen and a loss for Vertex, the Biogen-Sage results could very well determine which direction biotech goes next, according to RBC analyst Brian Abrahams. The data are expected by the end of June.

A recent Goldman Sachs survey of 75 investors at the bank's health-care conference highlights the ongoing uncertainty, with 47% saying the sector would outperform over the second half of the year while the rest were evenly split between expecting health stocks to underperform or move in-line with the broader market.

M&A Hopes

Vertex's recent failure also came with a silver lining: the potential for a deal to bolster its pipeline. "Management has signaled a new openness to later-stage deals, and the shelving of VX-864 may now force its hand," Bloomberg Intelligence analyst Marc Engelsgerd wrote in a note.

The pace of deals in the first half can determine the direction of biotechs for the rest of 2021, with years that start off with five or more deals over \$500 million usually driving the outperformance of nearly 4% for the Nasdaq Biotech index, according to JPMorgan's analysis.

As biotech specialists weighed the catalysts for further gains, an 86% jump for Chamath Palihapitiya-backed health insurer Clover drove interest toward once high-flying biotechs with highly shorted floats and mediocre analyst ratings. Inovio Pharmaceuticals Inc., which recently lost U.S. government funding for its Covid shot, and Clovis Oncology Inc., a fallen former M&A target with a disappointing cancer drug, popped this week as day traders targeted short-squeeze candidates.

Retail traders have also been driving triple-digit and even quadruple-digit gains in obscure biotech names like Ocugen Inc., a drug developer with plans to bring a Covid-19 vaccine to the U.S., and Cassava Sciences Inc., a 20-year old biotech whose main product isn't yet in the final stages of testing.

Loncar at least is unfazed by biotechs joining the meme parade. "Professionals understand what the true intrinsic value of a biotech is," he said in an interview. "Unlike GameStop or AMC, a biotech either has good science or it doesn't."

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Nicole Bullock

EXHIBIT 9



Wall Street's S&P 500 index was heading for its strongest weekly performance in three months © FT montage

Leke Oso Alabi in London and **Francesca Friday** in New York FEBRUARY 5 2021

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Global stocks reached their best week since November, as investors looked past [US job numbers](#) that marginally missed forecasts.

Wall Street's S&P 500 index rose 0.4 per cent at the closing bell in New York, taking the blue-chip benchmark up more than 4.5 per cent for week.

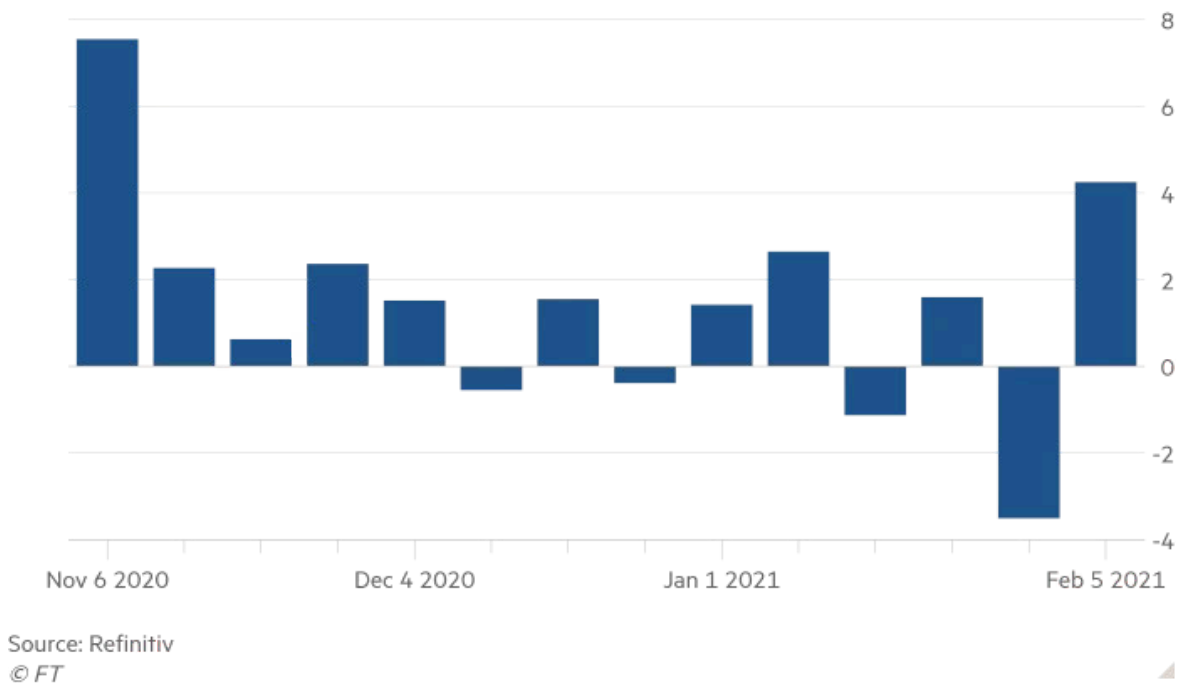
[Case 1:21-cv-00751-DAE Document 242 Filed 10/31/24 Page 295 of 495](#)
Shares in the small drug developer Cassava Sciences fell as low as 24 per cent on Friday after almost soaring 700 per cent this year to become the top stock in the Nasdaq Composite index, as past trading caps imposed on so-called meme stocks pushed factions of day traders into the biotech realm.

But the investor excitement surrounding biotech goes beyond the rise of the Austin-based company, which released a promising study on its drug candidate for the treatment of Alzheimer’s disease on Tuesday, to the forefront of day-trader chatter on Reddit and other platforms.

“To me, it’s investors contemplating what they believe are structural changes in the way that healthcare operates,” said Brian Levitt, global market strategist at Invesco. “I wouldn’t conflate that with what we saw in day-trading.”

Global stocks on pace for best week since November

FTSE All-World index, week-to-date performance (%)



Solid earnings results had also helped to underpin the rise in bourses this week, said Hani Redha, portfolio manager at Pine Bridge Investments.

In the US, 51 per cent of the companies in the S&P 500 have revealed results for the last quarter of 2020, according to Bloomberg data, with their earnings up 10 per cent if the coronavirus-hit energy sector was excluded, said Redha.

For companies on the region-wide Stoxx Europe 600 index, earnings were up 4 per cent, excluding energy, so far during this season, he added.

According to Redha, “the market [is] regaining confidence on the prospect of a reopening — we’re also seeing some pretty good results on earnings”.

The Stoxx Europe 600 index closed flat but was up 3.5 per cent for the week, for its best performance in three months. Frankfurt’s Xetra Dax was also little changed while the FTSE 100 in London slid 0.2 per cent.

Oil prices rose 1 per cent to \$59.45 a barrel for Brent crude. That took the international marker to its highest level since February last year, just before a plunge sparked by the [pandemic](#).

The pound continued to rally on Friday following a unanimous vote by the Bank of England’s Monetary Policy Committee on Thursday to keep its policy rate at 0.1 per cent and maintain the size of its bond-buying programme. But it was the guidance on UK negative rates — the BoE is mapping out the practicalities of a sub-zero move, but was clear there was no immediate plan to take the step — that allowed the pound to restart its move higher. Sterling rose 0.5 per cent against the dollar to \$1.3730 in afternoon trading.

The BoE decision also prompted a modest sell-off in UK debt, with the yield on the 10-year gilt rising 0.04 percentage points to 0.48 per cent on Friday, the highest level since the market tumult in March.

In Asia, China’s CSI 300 index rose 0.2 per cent, Hong Kong’s Hang Seng added 0.6 per cent and South Korea’s Kospi 200 jumped 1.1 per cent.

EXHIBIT 10

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+0.09%

39,164.06



S&P 500

+0.09%

5,482.87



NASDAQ 100

+0.19%

19,789.03



NEWS > STOCKS

Short sellers betting against meme stock Cassava have made \$100 million over the past month as the stock has struggled

Emily Graffeo Aug 31, 2021, 9:26 AM MDT

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in the past month, short sellers have made \$100 million betting against Cassava Sciences.

The profits come as the biotech firm loved by retail traders tumbles amid concerns over its Alzheimer's drug.

Though on Tuesday, the drugmaker posted a small gain, prompting many retail investors to remain bullish on the stock.

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6 ways small businesses can make an impact in 2024

In the past month, short sellers have made \$100 million betting against Cassava Sciences, as the biotech firm loved by retail traders tumbles amid concerns over its Alzheimer's drug, Bloomberg reported, citing data from S3 Partners.

Cassava is one of the lesser-known meme stocks of 2021, and just a month ago saw its year-to-date gains rise to 1,880%. It's now tumbled

over 50% as some raise questions about the integrity of its experimental treatment for Alzheimer's patients, called simufilam.

Last Wednesday, Cassava plunged as much as 30% in one day after a lawyer disputed the validity of the biotech company's clinical studies results. The lawyer from firm Labaton Sucharow alleges that some of Cassava's results show signs of data manipulation. According to Bloomberg, the lawyer is representing an unnamed short seller, and petitioned the Food and Drug Administration to halt trials of simufilam.

The allegations haven't crushed retail traders' bullishness on Cassava, however. On Tuesday, investors on social media site Stocktwits cheered Cassava's small 5% intraday gain and noted that the biotech company said the lawyer's allegations are false and misleading. Some even doubled down on their conviction and claimed they bought more Cassava shares.



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"Why can't these shorties accept their defeat and just ***k off?" one post read.

"I never sold a share and only loaded up more, don't think I'm done yet either!" another user commented. "Shorts have given us an opportunity of a life time and to you shorty I am grateful! Thank you and now burn."

According to Bloomberg and S3, about 13% of Cassava's float is sold short.

The saga encompasses a common theme this year of retail traders vs. institutional short sellers that has inspired many individual investors to pile into heavily-shortened stocks.



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EXHIBIT 11

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Short sellers hit back at Cassava lawsuit against them: 'We stand behind everything we wrote'

Last Updated: Nov. 4, 2022 at 12:21 p.m. ET
 First Published: Nov. 4, 2022 at 10:49 a.m. ET

By Anviksha Patel



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4 minutes

The defendants in a defamation lawsuit brought by Cassava Sciences have hit back at the plaintiff, saying it's one of the most "frivolous" lawsuits they've seen.

Biotech company Cassava Sciences **SAVA** is known for its shares rocketing to extreme heights after becoming a meme stock in 2021 and subsequently falling 62% over the last year after [questions arose in the quality and reliability of its trial results](#), which caused the firm to lose more than \$2 billion in market value.

Its stock has faced more recent nosedives after a report the U.S. Justice Department was [investigating whether Cassava has manipulated data from its Alzheimer drug trials](#).



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On Thursday, the firm launched legal action against a number of short sellers for its share collapse with a defamatory "disinformation" campaign, it alleged.

The Texas-based firm alleged that the defendants embarked on a "short and distort" campaign to "manipulate a stock price and financially benefit from their 'short positions' by defaming a company developing a drug for people with Alzheimer's disease."

The defendants include activist firm Quintessential Capital Management and numerous short-selling scientists, including neurobiologist David Bredt and cardiologist Geoffrey Pitt.

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In the 180-plus page lawsuit, Cassava said it had pumped millions of dollars, effort and time into developing the drug simufilam, which "showed promise as a treatment."

In the suit, Cassava claimed the short sellers had publicized that Cassava had "manipulated the testing of simufilam. Cassava had manipulated the results associated with simufilam, and Cassava was a fraud." The company alleged more than 240 false and defamatory comments in letters, reports and presentations, and more than 840 false and defamatory statements on social media.

One of the defendants said it might be able to turn the lawsuit against Cassava.



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"We stand behind everything we wrote," Gabriel Grego, managing partner of Quintessential Capital Management told MarketWatch on Friday. The investment firm accused Cassava of irregularities made in trials.

"This is one of the most frivolous lawsuits I've ever seen, and I expect it will be quickly dismissed. If it's not, we look forward to getting discovery on the company," he added.

Others named in the lawsuit are the authors of Cassavafraud.com: Adrian Heilbut, Jesse Brodtkin, Enea Millioris and Patrick Markey.

They have previously written to the FDA about their "grave concerns" regarding Cassava's studies to develop the drug.



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Brodtkin took to Twitter to react to the legal action, calling Cassava's move "pathetic."



Heilbut declined to comment. Markey did not respond.

Millioris told MarketWatch that he and his colleagues have sought legal advice, and only wished to say that he stands by his findings.

"Cassava seeks to demonize open scientific criticism and silence a debate around the company that had started long before we published our own report and findings. I stand by the findings of my scientific examination of their research which are supported by the relevant literature in the field," he said in an emailed statement.

Cassava has retained lawyer J. Erik Connolly from Benesch Friedlander Coplan & Aronoff LLP to take the case on.

"The allegations against the short sellers in the lawsuit speak for themselves. Cassava stands by its claims and looks forward to having its day in court," Connolly told MarketWatch.

"There are serious consequences when people use disinformation as a way to deflate a company's stock price and make money by shorting the stock," he added in a press release.

"These actions not only financially hurt the company and its investors, but they also cast a permanent cloud over research being done to try to find a treatment for a terrible disease. That is just wrong."

"We are still investigating whether additional individuals or entities should be brought into this case or have separate claims brought against them," he added. *MW*

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Interactive Brokers accepts \$48 million loss tied to NYSE glitch

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About the Author



Anviksha Patel

Anviksha Patel is a London-based reporter for MarketWatch, where she covers hedge funds and short sellers. She can be found on Twitter @annieiseating.

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EXHIBIT 12



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+0.09% 39,164.06

▼ **S&P 500**
+0.09% 5,482.87

▼ **NASDAQ 100**
+0.19% 19,789.03

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Meme stocks are riding a wave of Reddit enthusiasm again, as traders cheer fresh gains in GameStop, AMC, and BlackBerry

Isabelle Lee Aug 25, 2021, 8:26 AM MDT[Share](#)[Save](#)

Meme stocks are riding a renewed wave of enthusiasm from Reddit on Wednesday.

Among the most discussed stocks on Wall Street Bets were GameStop, AMC, Blackberry, Clover Health, and Cassava Sciences.

On the popular forum, one user — in a post that was upvoted over 20,000 times — said: "GME GANG IS BACK."

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A 6-step guide for small businesses looking to make an impact in 2024

Meme stocks are riding a renewed wave of enthusiasm from Reddit on Wednesday, as traders pile into old favorites amid a fresh wave of gains.

AMC and GameStop both climbed by double digits on Tuesday, but have given up some gains early in Wednesday's session. Still, Reddit traders are cheering a new bull run for both names.

Among the most hyped stocks on Wall Street Bets — Reddit's 10-million strong forum — were GameStop, which was mentioned 1,900 times in the last 24 hours, and AMC Entertainment, which garnered 638 mentions, according to data by Quiver Quantitative, an analytics firm. Blackberry was also mentioned 355 times as well as Clover Health and Cassava Sciences.

Data from WSBtrending also illustrates a rise in chatter around meme stocks.



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On the Reddit forum, one user — in a post that was upvoted over 20,000 times — said: "GME GANG IS BACK."

Another user said they turned \$90,000 to \$250,000 in one day, while another said they spent \$5,000 and grew it to \$20,000 in two hours. Both posts, referring to GameStop, have received thousands of upvotes.

Shares of the meme stock surged to their highest level in 10 weeks on Tuesday, though the stock has fallen in Wednesday trading.

Here's where the top-mentioned stocks on Wall Street Bets were trading as of 10 a.m. ET on Wednesday:

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GameStop: down 6.66% to \$198.28

AMC Entertainment: down 0.38% to \$44.09

Blackberry: up 1.60% to \$11.28

Clover Health: down 2.19% to \$8.73

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Cassava Sciences: down 28.97% to \$83.69

Meme stocks dominated market headlines for weeks at the beginning of this year, led by GameStop. The Texas-based company's stock skyrocketed from around \$40 to intraday highs of over \$450. AMC rallied as well, albeit to a fraction of the price GameStop achieved at its peak.



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GameStop stock tanks 24% as weak earnings trump Roaring Kitty's planned livestream

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Keith Gill scored a one-day gain of \$79 million after disclosing his GameStop stake on Reddit

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Roaring Kitty's 3 weeks of social media antics feeding frenzy in top stocks

EXHIBIT 13

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BTC ▲ \$62,010.15 +1.57%

ETH ▲ \$3,467.21 +2.63%

BNB ▲ \$583.43 +1.86%

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Markets

WallStreetBets Reddit Group: What Is It?

The WallStreetBets’ Reddit army of amateur traders is turning the tables on traditional investors.

By Ollie Leech Jan 28, 2021 at 7:33 a.m. MST Updated Feb 9, 2023 at 6:21 a.m. MST

f in X



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A decentralized Reddit forum called WallStreetBets is causing chaos on Wall Street.

The group "r/Wallstreetbets" (aka WSB) is a longstanding subreddit channel where over 3.5 million Reddit users discuss highly speculative trading ideas and strategies. Described as "like 4chan found a Bloomberg Terminal," the community has caused huge disruption to financial markets this week.

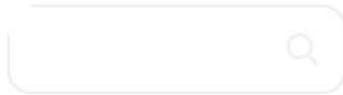
Read More: [GameStop Enters the Metaverse With 'Web3 Gaming' Job Post](#)

On Sept. 19, 2020, a Redditor with the handle Player896 published a post in the channel entitled "[Bankrupting Institutional Investors For Dummies, ft GameStop](#)." In it, the person outlined a strong bullish case for GameStop (GME), a brick-and-mortar business that primarily sells video games and consoles. Since November 2015 the company's stocks had been steadily declining due to a shift from physical media to digital, and the arrival of the COVID-19 pandemic.

WallStreetBets' GameStop opportunity

The author noted that GameStop stock was being heavily sold short at the time by a number of institutional investors, despite the fact "their books are rock-solid" and Chewy CEO and co-founder Ryan Cohen had spent almost \$76 million for a 12.9% stake in the company. Cohen – the largest individual shareholder of Apple Inc. – later [joined the GameStop board](#) along with two former associates from his pet health products company on Jan. 11, causing the stock price to soar 50%.

Even after Cohen joined the board and the stock price began to rebound, a handful of hedge funds and other institutional investors continued to [short-sell](#) GME stock. This was likely an attempt by large players to out-muscle amateur traders and induce panic selling. The WallStreetBets Reddit community saw this as an opportunity to push back against the financial elite and decided to whip up a buying frenzy in the hopes of creating a major short squeeze. A short squeeze might sound complicated but it's actually a relatively straightforward process. When institutional investors short-sell a stock, what they actually do is borrow a number of shares they believe will drop in value, sell them at the highest price possible and try to buy them back later at a lower price. If they're successful, they hand the initial borrowed amount back and pocket the difference.



If the market turns against them, however, and the price of the shares increase, the trader is forced to buy the shares back at a loss. If the price rises dramatically within a short space of time it can cause devastating losses for the **short-seller**. In addition, because short-sellers are forced to buy back into the asset when a short squeeze happens, it helps drive prices even higher.

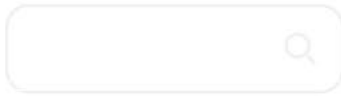


WallStreetBets crushes hedge funds, crashes trading apps

Melvin Capital, a U.S.-based hedge fund, and Citron Research were among the short-sellers impacted by the WallStreetBets army short squeeze. Two major hedge funds, Citadel and Point27 Asset Management, have since stepped in to save Melvin Capital with a **\$2.75 billion bailout**.

In nine days, GME stocks skyrocketed over 1,800% from \$19.79 to a high of \$380. Cohen's 13% stake in the company is now worth \$2.5 billion.

The world's richest man, Elon Musk, added even more fuel to the WSB inferno by tweeting his support with the word "**Gamestonk!**" – a deliberately misspelled version of "stock" popularized by an internet meme.



The WallStreetBets traders didn't stop there. [BlackBerry](#), [AMC](#), [Nokia](#), and [Bed Bath & Beyond](#) have become the next set of heavily shorted stocks to enjoy the WSB treatment, posting 24%, 310%, 70%, and 46% gains on Wednesday, respectively.

Mobile-friendly trading apps such as Robinhood and Trading212 both [suffered outages](#) during the opening of the American markets Wednesday morning as retail traders flooded in to join the frenzy.

In response to this extraordinary event, Adena Friedman, the CEO of Nasdaq – the second-largest stock exchange in the world – said the platform has begun [monitoring](#) social media and will halt trading if another WallStreetBets-driven pump is flagged. TD Ameritrade has also [limited](#) GameStop trading on its platform.

The WallStreetBets Reddit channel briefly went private on Wednesday in response to millions of new users pouring in. Discord also reportedly [banned](#) the WallStreetBets server due to a flurry of discriminatory posts and hateful comments. In a [post](#), the moderators of WSB commented, "We have grown to the kind of size we only dreamed of in the time it takes to get a bad night's sleep. We've got so many comments and submissions that we can't possibly even read them all, let alone act on them as moderators."

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Ollie Leech

Ollie is the Learn editor for the Crypto Explainer+ section. He holds some SOL, RAY, CHSB and BTC.

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EXHIBIT 14



Biotechnology

Cassava Sciences Inc. (SAVA)

EQUITY RESEARCH

July 14, 2021

Price: \$97.00

Price Target: \$100.00 (From \$73.00)

Rating: Neutral (From Overweight)

Key Statistics:

Symbol	NASDAQ: SAVA
52-Week Range	\$2.78 - \$117.54
Market Cap (\$M)	3,880.8
ADV (3 mo)	2,195,439
Cash (M)	\$282.2
Shares Out (M)	40.0

Research Analysts:

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REV (\$M)

FYE	2020A	2021E	2022E
1Q	\$0.0	\$0.0A	-
2Q	\$0.0	\$0.0E	-
3Q	\$0.0	\$0.0E	-
4Q	\$0.0	\$0.0E	-
Year	\$0.0	\$0.0E	\$0.0

EPS

FYE	2020A	2021E	2022E
1Q	\$(0.05)	\$(0.09)A	-
2Q	\$(0.05)	\$(0.17)E	-
3Q	\$(0.06)	\$(0.24)E	-
4Q	\$(0.09)	\$(0.27)E	-
Year	\$(0.24)	\$(0.78)E	\$(1.50)



Company Update

AAIC'21 Data May Bode Well for Simu' Clinical Success with Time, but Priced for Perfection?

Investment Summary. We are downgrading our rating to Neutral from Overweight, while raising our 12-month price target of \$100 on SAVA shares. Though we remain bullish on lead candidate, simufilam, we believe the program insufficiently de-risked for SAVA shares to trade significantly north of current levels, after having appreciated by over 1400% YTD.

As a result, we step to the sidelines pending longer-term (12-month) data from the ongoing open-label study, and increased visibility on the operationalization of the P3 program, both by YE21. Our PT change is the result of our enhanced view of residual unmet need in Alzheimer's disease (AD), and the potential for development success with biomarker-driven disease-modifying therapies, both post approval of aducanumab.

Based on our diligence, we believe that the current valuation is, in part, being fueled by shorter-horizon investors, who comprise over 60% of ownership (see Exhibit 3). Additionally, recently, the company PR'd (note [here](#)) that it will present the results from a pre-specified interim analysis from its open-label study of simu' at the upcoming 2021 Alzheimer's Association International Conference (AAIC) on July 26-29th.

Although we expect the results to be incrementally positive, and we acknowledge that we could be surprised to the upside if 9-month data significantly improve upon 6-month results within the open-label study, we expect the data to "only" reinforce our previously promulgated thesis on simu's potential. Specifically, we look for continued differentiation vs. natural history as well as safety signals (note [here](#)). In our view, this 9-month observation period may support simu' activity, which we believe should be evaluated in a controlled study. We acknowledge that the longer stable cognition is observed, the more encouraging the observation is in an AD patient population, even from an uncontrolled study. However, we also note that the unblinded study protocol could generate changed lifestyle factors that, over a short and variable period (3-9 months), may have durable benefit to patients independent of simu' activity. Therefore, we reiterate that we await 12-month data to consider earlier, 6- and 9-month observations as anything more than provocative from this open-label study.

Perspective building. We believe that there are two recent events which have been driving SAVA shares. 1) On February 2nd of this year, Cassava released interim 6-month data from its open-label study of simu' in Alzheimer's disease (AD) patients. 2) The FDA approval of Aducanumab for AD patients on June 7th of this year. Though we view these events as positive for the stock (notes [here](#) & [here](#)), given the recent share price appreciation, we would need to see additional positive and mature clinical data for simu', and operationalization of the pivotal trials, to sufficiently de-risk the program to possibly justify a more constructive stance at current trading levels.

It has been the long-standing view of Team Duncan (note [here](#)) that the soon-to-arrive future world of AD treatments will increasingly be comprised of precision medicine strategies. Years of research have improved understanding of the etiology and clinical course of neuro-diseases, including biology, genetics, pathology/ imaging, allowing for the identification of drug targets. Although several targets have been identified and hundreds of compounds have been evaluated in clinical studies, prior to the recent Aduhelm approval, there had not been an approval of a novel drug for Alzheimer's since 2003. As of early 2020, there were 121 unique agents in clinical trials for AD. Among them are several

dozen orally administered small molecule candidates in the clinic covering a wide range of pathways/mechanisms/targets, which we believe may comprise the future SoC. Though the aducanumab approval enhanced our conviction in this thesis, we did not believe it was dependent upon it.

We believe simu', a small molecule with a unique mechanism may have potential as a disease-modifying therapy. In the P2b study, it demonstrated significant reduction in key AD and neurodegenerative disease biomarkers (total-tau, phospho-tau, NfL and neurogranin) as well as neuroinflammation markers (YKL40, IL-6, and sTREM) over a short 28-day treatment course. Though provocative, we believe these data need to be complemented by a long-term, pbo-controlled trial, demonstrating durable efficacy, before we can enhance our conviction in the program.

The company is currently conducting a 12-month open-label study of simu' in AD patients, which we believe can provide perspectives on the candidate's safety profile and possibly some indications of efficacy as well, relative to "natural history." In addition, Cassava recently guided that it aligned with the FDA on a path forward for simu' and we expect the company to initiate two P3 trials, one in each 3Q21E and 4Q21E.

Directionally positive, but not (yet) conclusive, data. On February 2nd of this year, Cassava released 6-month interim data from the first ~50 patients on the non-blinded open-label study of simu' in AD. The analyses show an ~10% (1.6 points) mean improvement in cognition as measured by the Alzheimer's Disease Assessment Scale-Cognitive 11 (ADAS-cog11). Additionally, an ~29% (1.3 points) improvement in dementia-related behavior (anxiety, delusions and agitation) as measured by the Neuropsychiatric Inventory at 6 months as compared to baseline. Although we find these data provocative and encouraging, we interpret the observations with caution, as it is an open-label study that can be confounded by variables, such as expectation bias, especially over a short 6-month observation period.

In addition, there is a relatively old, published paper that projects cognitive decline based on literature data to describe the longitudinal response in the Alzheimer's Disease Assessment Scale-Cognitive (ADAS-cog, change from baseline) in mild-to-moderate severity AD patients (Alzheimer's Dement. 2010 Jan;6(1):39-53). The model was used to estimate disease progression for pbo-treated patients and acetylcholinesterase-inhibitor-treated patients, and factors that may have affected disease progression.

Exhibit 4 shows what we believe is a key figure from this paper, which is a time-course of ADAS-cog from simulated datasets for the pbo group (solid line, mean estimate; dashed lines, 90% confidence intervals). The red line that we inserted at the zero marker shows that several of the simulations fall below zero at the ~6-month point, suggesting cognitive improvement in the pbo group. The authors of the paper stated that the halftime to reach the maximum pbo effect was 5.6 weeks, and the halftime to diminish the pbo effect was 22.7 weeks, indicating that the maximum pbo effect in trials included in this analysis occurred at around 11 weeks, and disappeared within 1 year, i.e. the 12+ months that we would need to see improvement from an uncontrolled study. These estimates are longer than previously hypothesized from patient-level analyses, where the pbo effect was estimated to fade to zero after about 6 weeks. Our assumptions are consistent with these statements, which is why we are "only" cautiously optimistic with the recent open-label patient experience at 6 months.

Moreover, in the same paper, the researchers estimated that the maximum symptomatic effect in acetylcholinesterase (AChE) inhibitors, such as donepezil, galantamine, and rivastigmine, had a halftime of 1.42 to 13.1 weeks, indicating that the maximum symptomatic effects could be observed from 3 to 26 weeks on the medication. Therefore, an improvement in cognition at 6 months, in an open-label study, no less, should be taken with caution, in our view. However, in exhibits 5 and 6, we do see ADAS-cog scores slowly climb back to baseline after 6 months group (solid line, mean estimate; dashed lines, 90%

confidence intervals; The red line at the zero marker, which we inserted, shows that several of the simulations fall below zero at the ~6-month point).

Uncontrolled, 9-month data could be an incremental conviction boost, but we think that 12-month is “real.” The company announced that it will present the results from a pre-specified interim analysis from its open-label study of simu’ at the upcoming 2021 Alzheimer’s Association International Conference (AAIC) on July 26-29th. The analysis will summarize the cognition data from the first 50 mild-to-moderate AD patients to complete at least 9 months of the study. We will keep an eye out for continued differentiation vs. natural history as well as safety signals. In addition, the company plans to present biomarker data for amyloid- β 42, total tau, P-tau181, NfL, YKL-40, sTREM2 and HMGB1 beyond what has been previously disclosed, which will allow us to further gauge the simu’s potential as a disease-modifying agent.

Based on the aforementioned paper, we would expect to see a decline in cognitive scores at 9 months from 6 months. Therefore, a maintenance or improvement in ADAS-cog11 could be evidence of an efficacy signal which could, at least incrementally, enhance our conviction. In addition, significant reduction in biomarkers such as amyloid- β 42, total tau, P-tau181, and NfL, may be suggestive of evidence of disease modification, and could be a conviction supporter as well.

The path forward. The company plans to conduct two P3 studies. One P3 study will evaluate simu’s disease-modifying activity in AD patients over an 18-month period and the second P3 will evaluate symptomatic improvement over the course of 9-12 months. We anticipate the initiation of the first P3 (18-month) study in 3Q21, followed by the second P3 (9-12 month) in 4Q21. The first P3 study will enroll ~1000 mild-to-moderate Alzheimer’s disease patients. The subjects will be randomized (1:1:1) to simu’ 100mg, 50mg, or pbo BID and treated for 18 months. The second P3 will enroll ~600 mild-to-moderate Alzheimer’s disease patients. In this 2nd study, subjects will be randomized (1:1) to simu’ 100mg or pbo BID for 9-12 months.

For both studies, the co-primary efficacy endpoints are ADAS-Cog and ADCS-ADL, designed to measure changes in cognition and function, respectively. One key secondary efficacy endpoint will be the iADRS, a scale that combines cognitive and functional scores from ADAS-Cog and ADCS-ADL. Additional secondary endpoints will include biomarkers of disease and neuropsychiatric assessment (NPI).

In our view, this strategy may allow for a time/capital efficient development program. With this EoP2 update, and enhancements being made to the ongoing post-P2 OLE study, we now envision a scenario in which accelerated approval may be granted based on positive data from a pbo-controlled 9-12-month study, whether conditional or otherwise, followed by the longer 18-month study for full approval or as an sNDA. If the company commences enrollment in the 9-12-month study by YE’21, we guesstimate full enrollment could occur by 1H23 (or earlier) followed by data in 2H23/1H24. If we adopt a conservative view on data review and submission timelines, and assume NDA filing later in 1H’24, we think that we may see a PDUFA date early’25 (accelerated review).

Changes to our model. We raised the annual cost of simufilam in our market model to \$52,000 from \$45,696, such that it is more in line with that of aducanumab (\$54,000). In addition, we raised our contribution margin to 60% from 50% to better reflect the real-world margins of small molecules.

Exhibit 1: Simufilam Market Model

Simufilam in AD - U.S.	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E
U.S. Population ≥65 Years of Age ('000)	58,040	58,447	58,856	59,268	59,683	60,100	60,521	60,945	61,371
Growth Rate	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%
Percent of Patients with Alzheimer's Disease	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Number of Alzheimer's Disease Patients ('000)	5,804	5,845	5,886	5,927	5,968	6,010	6,052	6,094	6,137
Mild-to-Moderate Patients	57%	57%	57%	57%	57%	57%	57%	57%	57%
Simufilam Target Population ('000)	3,308	3,331	3,355	3,378	3,402	3,426	3,450	3,474	3,498
Penetration Rate	0.5%	1%	3%	7%	12%	14%	16%	18%	20%
Annual Cost	\$52,000	\$53,040	\$54,101	\$55,183	\$56,286	\$57,412	\$58,560	\$59,732	\$60,926
Daily Cost of Simufilam	\$ 142	\$ 145	\$ 148	\$ 151	\$ 154	\$ 157	\$ 160	\$ 164	\$ 167
Price Growth Rate	2%	2%	2%	2%	2%	2%	2%	2%	2%
Number of Doses per Year	140	280	280	280	280	280	280	280	280
Gross-to-Net	30%	30%	30%	30%	30%	30%	30%	30%	30%
US Simufilam Revenue (Unadjusted) ('000)	\$230,947	\$948,859	\$2,923,834	\$7,007,435	\$12,338,772	\$14,785,921	\$17,356,812	\$20,056,360	\$22,889,656
Probability of Success	55%	55%	55%	55%	55%	55%	55%	55%	55%
US Simufilam Revenue (Probability Adjusted) ('000)	\$127,021	\$521,873	\$1,608,109	\$3,854,089	\$6,786,325	\$8,132,256	\$9,546,247	\$11,030,998	\$12,589,311
Contribution Margin	60%	60%	60%	60%	60%	60%	60%	60%	60%
CF to Cassava ('000)	\$76,212	\$313,124	\$964,865	\$2,312,454	\$4,071,795	\$4,879,354	\$5,727,748	\$6,618,599	\$7,553,586

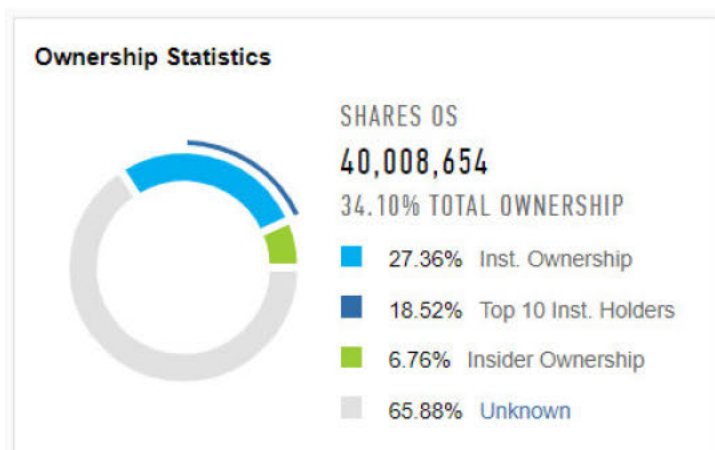
Source: Cantor Fitzgerald research

Exhibit 2: SAVA Valuation Matrix

Program	NPV ('000)	NPV/Share	% of total
Simufilam	\$3,912,365	\$95.14	95%
Simufilam in other indications	\$150,000	\$3.65	4%
FLNA Platform Placeholder	\$50,000	\$1.22	1%
Total	\$4,112,365	\$100.01	100%

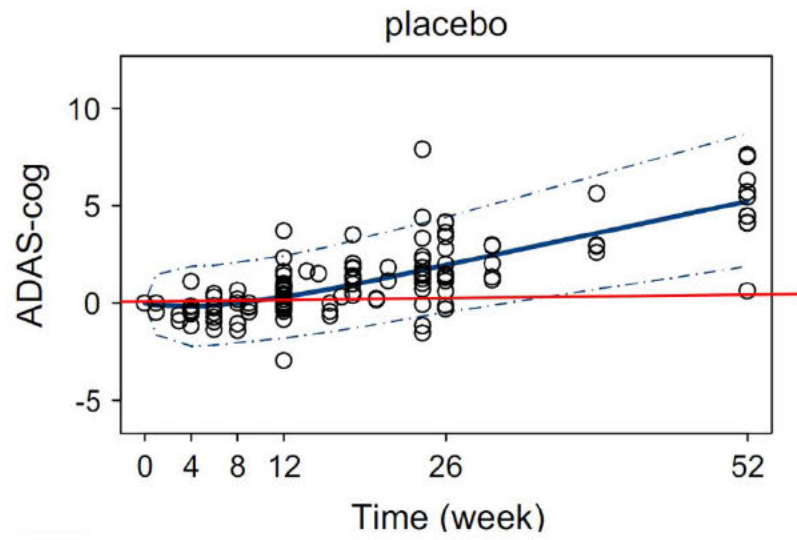
Source: Cantor Fitzgerald research

Exhibit 3: SAVA Ownership



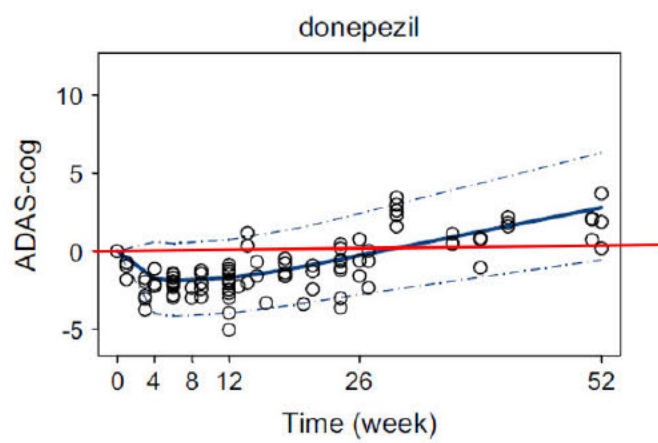
Source: FactSet

Exhibit 4: Time-course of ADAS-cog for placebo group



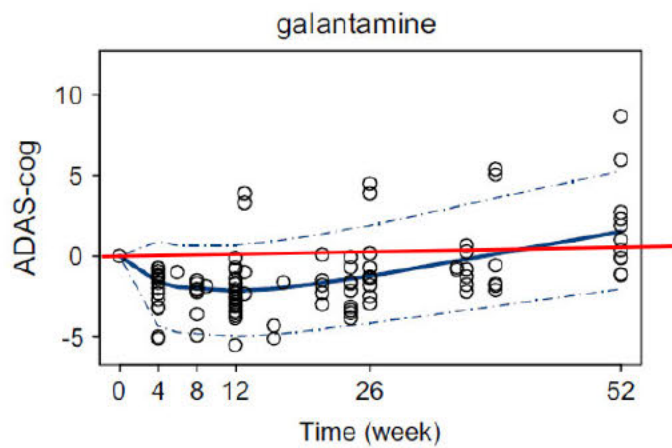
Source: *Alzheimers Dement.* 2010 Jan;6(1):39-53.

Exhibit 5: Time-course of ADAS-cog for donepezil group



Source: *Alzheimers Dement.* 2010 Jan;6(1):39-53.

Exhibit 6: Time-course of ADAS-cog for galantamine group



Source: *Alzheimers Dement.* 2010 Jan;6(1):39-53.

Valuation

In valuing SAVA, we use a DCF analysis, in which we have estimated the free cash flow to Cassava from simufilam in Alzheimer's disease by applying a 60% cash flow contribution margin to our probability-adjusted revenue projections, which yields \$95.14/share. We use a 55% probability of success and a 25% discount rate. We also have a \$50M FLNA platform pipeline placeholder that yields \$1.22/share, and a \$150M placeholder for simufilam in other neurodegenerative disorders (\$3.65/share).

Risks

Development, regulatory & commercial risks

Sumifilam

The open-label study results may not replicate the P2a and P2b results.

The P3 study may not show efficacy with long-term dosing.

Long-term dose may result in safety signals not observed with short-term dosing.

The studies may be halted due to unforeseen safety and/or tolerability issues.

Additional risks

If approved, new, more efficacious products may enter the market and may compete for market share.

The company may fail to secure funding for the P3 or commercialization, should it be approved.

Company Description

Cassava is a Neuro-Innovator focused on developing candidates for the treatment of Alzheimer's, including sumifilam, by leveraging its platform & deep understanding of a novel misfolded CNS protein filamin-A.

Disclosures Appendix

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Overweight/OW: We expect the stock's total return to exceed 15% over the next 12 months. For the purpose of calculating the percentage of subject companies within the Buy, Hold, and Sell categories for whom Cantor Fitzgerald has provided investment banking services within the previous 12 months, an Overweight rating equates to a Buy rating.

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Performance parameters should be interpreted flexibly as general guidelines relating to performance over a twelve-month period and are not intended to be influenced by short-term share price volatility. Performance in this context is evaluated in terms of total absolute return.

Total return is defined as the sum of (1) the percentage difference between the target price and the current price and (2) the expected dividend yields of the stock.

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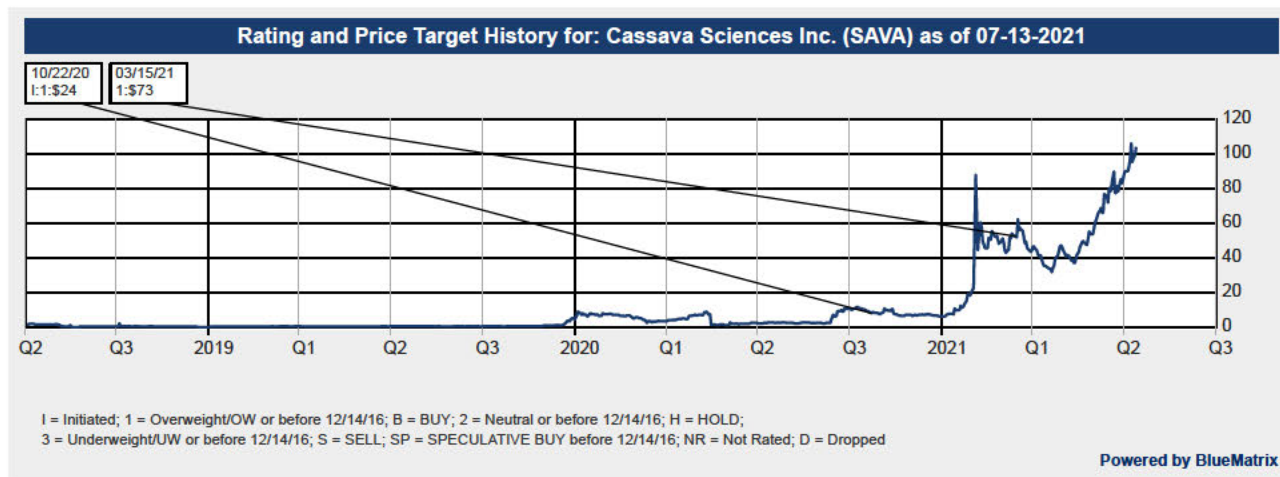
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Distribution of Ratings/Investment Banking Services (IB) as of 07/14/21

Rating	Cantor		IB Serv./Past 12 Mos.	
	Count	Percent	Count	Percent
BUY [1/B]	216	84.70	158	73.15
HOLD [2]	37	14.51	11	29.73
SELL [SL/3]	2	0.78	0	0.00



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EXHIBIT 15



Equity Research: Healthcare

COMPANY NEWS

July 29, 2021

Cassava Sciences, Inc.

NASDAQ: SAVA

Rating: BUY

Price Target: ↑\$215 from \$110

Last Price (July 28, 2021): \$135.30

Raising PT to \$215/BUY. 9-Month Data De-Risk 12-Month Data in 4Q21; Randomized Trial Data Could be in 1H/mid22

Summary: Cassava's 9-month cognition data in 50 mild-to-moderate Alzheimer's disease patients showed ADAS-Cog 11 score improvement of -3.0-points over baseline – continuing to show cognitive improvements compared to 6-month data showing -1.6-point improvement. Meta-analysis data have shown patients on placebo to deteriorate to approx. +4-points at 9-months. Hence, Cassava's simufilam is showing a reversal of 7-points in ADAS-Cog 11 score. To be noted that mild to moderate patients are harder to treat versus Biogen's (BIIB, Not Rated) early stage patients. Despite the caveats of Cassava's this trial being an open label, being prone to biases and not being a randomized control trial – we believe a randomized controlled trial could diminish the extent of cognition benefits but would still well outperform Biogen's and Eli Lilly' (LLY, Not Rated) drugs.

We believe today's data at 9-month well de-risks 12-month data in 4Q21. The biases should be lower in today's data and should further diminish at 12-months. Additionally, Cassava is treating mild to moderate patients which is a much better defined population compared to Biogen's early stage – lack of need to show plaques, a better defined population and presumably inline to higher price point for simufilam shows clear path to market, faster ramp and higher upside to our \$40K/year estimate of the drug price.

Cassava is currently enrolling 100+ patient randomized control trial in mild to moderate AD patients – we expect enrollment to complete fast and we could see initial set of data in 1H/mid-2022. Two Phase 3 trials will start recruiting in 3Q21. Depending on the FDA's response to Eli Lilly filing on Phase 2/3 data, we could see Cassava mirroring Lilly's move and file on randomized Phase 2 trial data as simufilam is likely to outperform Lilly's drug. Given the catalyst rich next 6-12 months, we are reiterating BUY on SAVA and raising PT to \$215 from \$110.

Model Changes: Following positive 9-month cognition data, we are raising POS to 30% from 20%, raising market penetration to 25% from 15% and reducing discount rate to 23% from 25% – raising our adjusted peak sales to \$45BN in 2035, and raising our PT to \$215 from \$110.

STOCK DATA

Market Cap (\$BN)	\$5.4
Fully diluted shares (MM)	39.8
52-Week Range	\$2.78 – \$142.75
3-Month Avg. Daily Vol. (MM)	2.6
Short Interest (% of Float)	12%

BALANCE SHEET DATA

Cash & Cash Eq. (\$MN)	\$282
Total Assets (\$MN)	\$284
Total Debt (\$MN)	\$0
Cash/Share	\$7.08
Est. 2021 Cash Burn (\$MN)	\$28
Fiscal Year End	December

REVENUE (\$MN)

	2020A	2021E	2022E
1Q	0.0	0.0A	—
2Q	0.0	0.0	—
3Q	0.0	0.0	—
4Q	0.0	0.0	—
FY	0.0	0.0	0.0

EPS (\$)

	2020A	2021E	2022E
1Q	(0.05)	(0.09)A	—
2Q	(0.05)	(0.14)	—
3Q	(0.06)	(0.15)	—
4Q	(0.09)	(0.18)	—
FY	(0.24)	(0.57)	(0.76)

STOCK CHART - 1 Year History



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Ongoing Phase 2 open label study—9 month data update:

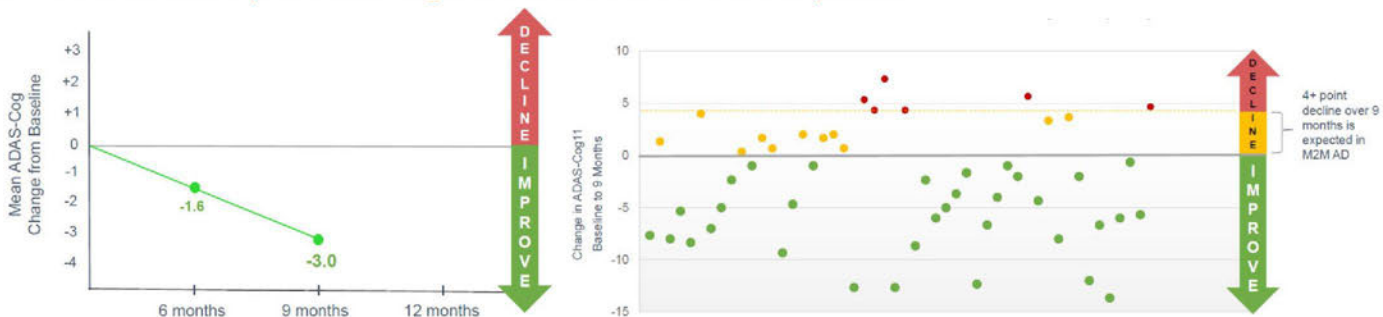
At AAIC, after 9 months of treatment with Cassava's simufilam, we continue to see marked improvement in cognition in 50 patients with mild to moderate AD. Cognition was analyzed by ADAS-Cog11 score and showed improvement of 3.0 points (18%) from baseline ($p < 0.001$) compared to 1.6 points (10%) at 6 months. An improvement in cognition was observed in 66% (33/50) of patients at 9 months and 22% of patients declined less than expected (11/50), Exhibit 1. Explanations for the difference in response between patients is currently not known, we look forward to further updates for clarification, possibly a predictive biomarker.

Simufilam also showed an effect on dementia-related behavior, increasing the number of patients with no neuropsychiatric symptoms to >50% of study subjects at 9 months compared to 38% at 6 months. Although, we did not see the absolute scores on NPI at 9-months.

Finally, CSF biomarker data collected from 25 patients after 6 months of treatment showed significant improvement in all measured biomarkers (all $p < 0.00001$): Alzheimer's disease, neurodegeneration, and neuroinflammation (Exhibit 2). These results also indicate a deepening of response as they improved upon Phase 2b study results, in which patients were treated for 28 days.

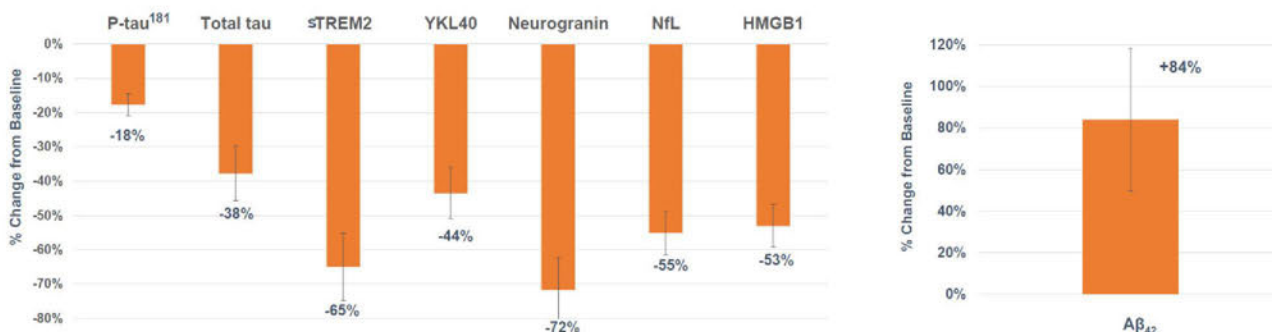
With no drug-related serious adverse events observed and promising trend towards the 12 month data, we see significant de-risk in the planned Phase 3 program, where the efficacy of simufilam will be tested. Based on literature, AD patients decline approx. 5.5 points per year in ADAS-Cog scores [Kaori Ito, Thomas Tensfeldt, et al. Alzheimer's & Dementia. 2010, Vol. 6(1)], indicating that even maintenance at baseline is a significant outcome for these patients. While we anticipate lower scores in a placebo controlled trial, any significant improvement from the expected decline after 12 months of treatment will be a game changer in the space.

Exhibit 1. Simufilam improve ADAS Cog11 scores at 9 months in 66% of patients.

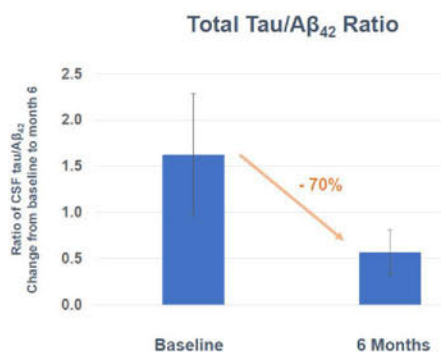


Source: Cassava Sciences presentation (AAIC 2021).

Exhibit 2. Simufilam improved specific AD, neurodegenerative, and neuroinflammation biomarkers.



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Source: Cassava Sciences presentation (AAIC 2021).

While this is an open label study, this is a promising trend compared to peer's data that show a decline at a similar time point. Moreover, this is a harder to treat population compared to Biogen's early stage patients. Below we have tabulated the data from simufilam at baseline and six months and with aduhelm and Lilly's donanemab at six and nine months (Exhibits 3 and 4). We have used the data from the EMERGE trial with aducanumab at the higher dose (i.e. the best cases) and estimated the scores as indicated. For Lilly's donanemab, we have used the data from the Phase 2 TRAILBLAZER-ALZ trial.

Declining MMSE score means deterioration, while increasing ADAS-Cog11 or -Cog13 and NPI score means worsening of conditions. The difference between the baseline ADAS scores between Cassava's trial versus Biogen or Lilly's trials is due to the fact that Cassava used Cog11 vs Biogen and Lilly using Cog13 (ADAS-COG13 = ADAS-Cog11 items + Delayed Word Recall and Digit Cancellation).

Exhibit 3. Comparison of simufilam versus aducanumab and donanemab in AD patients.

	Simufilam (SAVA)			Placebo (BiIB's EMERGE; high dose)			Aducanumab (BiIB's EMERGE; high dose)		
	Baseline	6 months	9 months	Baseline	6 months*	9 months*	Baseline	6 months*	9 months*
Mean ADAS-Cog (see footnote)	16.6	15	13.6	21.9	23.3	23.8	22.2	22.9	23.5
% Improvement or decline	-	-10%	-18%	-	6%	9%	-	3%	6%
Mean Neuropsychiatric Inventory (NPI)	4.7	3.4	-	-	-	-	-	-	-
% Improvement or decline	-	-28%	-	-	-	-	-	-	-
Mean Mini-Mental State Exam (MMSE)	22.6	-	-	26.4	24.7	24.5	26.3	24.6	24.2
% Improvement or decline	-	-	-	-	-6%	-7%	-	-6%	-8%

	Placebo (LLY)			Donanemab (LLY)		
	Baseline	6 months	9 months	Baseline	6 months	9 months
Mean ADAS-Cog (see footnote)	27.5	27.7	28.9	27.6	27.3	28.1
% Improvement or decline	-	1%	5%	-	-1%	2%
Mean Mini-Mental State Exam (MMSE)	23.7	23.0	22.5	23.6	22.9	22.7
% Improvement (decline)	-	-3%	-5%	-	-3%	-4%

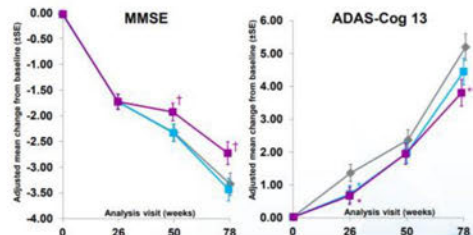
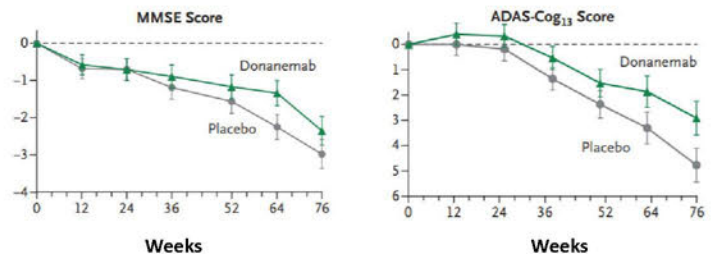
Note: ADAS-Cog11 for simufilam, ADAS-Cog13 for aducanumab & donanemab

* JT estimates

Sources: Cassava's corporate presentation, Biogen's presentation (bit.ly/3yNMZzi), Donanemab publication (bit.ly/3fc8FXw).

Exhibit 4. Key data with aducanumab and donanemab.**EMERGE: Baseline disease characteristics**

	EMERGE		
	Placebo (n=548)	Low dose (n=543)	High dose (n=547)
RBANS delayed memory score, mean \pm SD	60.5 \pm 14.23	60.0 \pm 14.02	60.7 \pm 14.15
MMSE score, mean \pm SD	26.4 \pm 1.78	26.3 \pm 1.72	26.3 \pm 1.68
CDR global score, n (%)	544 (99.3) 3 (0.5)	543 (100) 0	546 (99.8) 1 (0.2)
CDR-SB score, mean \pm SD	2.47 \pm 0.999	2.46 \pm 1.011	2.51 \pm 1.053
ADAS-Cog 13 score, mean \pm SD	21.9 \pm 6.73	22.5 \pm 6.76	22.2 \pm 7.08
ADCS-ADL-MCI score, mean \pm SD	42.6 \pm 5.73	42.8 \pm 5.48	42.5 \pm 5.82

**Donanemab**

Sources: Biogen's presentation (bit.ly/3yNMZzi) and Donanemab publication (bit.ly/3fC8FXw).

Key catalysts for SAVA: (1) 4Q21: Cassava's 12 month data from the ongoing open-label study in AD, (2) 2H21: Lilly's zagotenemab (anti-tau ab) Phase 2 results, and (3) 1H/mid-2022: potential data from Phase 2 randomized controlled trial with simufilam.

Valuation & Risks for SAVA: Our DCF/NPV/PE based valuation indicate a 12-month price target of \$215—approx. \$45BN in probability adjusted peak sales in 2035 from simufilam in mild to moderate Alzheimer's disease with a probability of success (POS)/market penetration of 30%/25%. Key risks include clinical trial failure, strict regulatory hurdles leading to peer trial failures and competitive pressure.

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Cassava Sciences, Inc. (SAVA)

July 29, 2021

Financial Table — Income Statement, Quarterly

SAVA - QUARTERLY IS (\$MN)	2019A	1Q20A	2Q20A	3Q20A	4Q20A	2020A	1Q21A	2Q21E	3Q21E	4Q21E	2021E	2022E
Simufilam Alzheimer disease	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Product Revenues	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Royalty Revenues	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Collab. & Licensing Revenues	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Revenue	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
COGS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
R&D	1.6	0.5	0.6	0.4	1.5	3.1	2.5	3.5	4.0	5.0	15.1	22.7
SG&A	3.4	0.8	0.8	1.0	1.1	3.7	1.0	2.0	2.3	2.8	8.1	9.7
Gain on sale of property and equipments	0.0	(0.1)	(0.2)	0.0	0.0	(0.3)	0.0	0.0	0.0	0.0	0.0	0.0
Operating Income	(5.0)	(1.2)	(1.2)	(1.4)	(2.6)	(6.4)	(3.5)	(5.5)	(6.3)	(7.8)	(23.2)	(32.4)
Income (expense) & others, net	0.3	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Pretax income	(4.6)	(1.2)	(1.1)	(1.4)	(2.6)	(6.3)	(3.5)	(5.5)	(6.3)	(7.8)	(23.2)	(32.4)
Income Taxes	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Tax Rate</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>
Net Income	(4.6)	(1.2)	(1.1)	(1.4)	(2.6)	(6.3)	(3.5)	(5.5)	(6.3)	(7.8)	(23.2)	(32.4)
Unrealized gain/(loss) on securities available-for-sale	0.0	0.0	(0.0)	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	0.0	(0.0)	(0.0)
Reported EPS	(\$0.27)	(\$0.05)	(\$0.05)	(\$0.06)	(\$0.09)	(\$0.24)	(\$0.09)	(\$0.14)	(\$0.15)	(\$0.18)	(\$0.57)	(\$0.76)
Reported Ordinary Shares Outstanding (MM)	17.4	24.5	24.8	25.0	30.2	26.1	37.7	39.8	42.2	42.5	40.6	42.5

Source: Company Reports & JonesTrading Estimates

Cassava Sciences, Inc. (SAVA)

July 29, 2021

Financial Table — Income Statement, Annual

SAVA - ANNUAL IS (\$MN)	2019A	2020A	2021E	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E	2034E	2035E
<i>Simufilam Alzheimer disease</i>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 31	\$ 1,055	\$ 4,001	\$ 8,880	\$ 14,756	\$ 20,735	\$ 26,818	\$ 33,006	\$ 39,301	\$ 44,661
Total Product Revenues	-	-	-	-	-	-	-	31	1,055	4,001	8,880	14,756	20,735	26,818	33,006	39,301	44,661
Royalty Revenues	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Collab. & Licensing Revenues	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Revenue	-	-	-	-	-	-	-	31	1,055	4,001	8,880	14,756	20,735	26,818	33,006	39,301	44,661
COGS	0	0	0	0	0	0	0	5	158	600	1332	2213	3110	4023	4951	5895	6699
R&D	2	3	15	23	27	28	29	29	30	31	32	32	33	34	35	36	37
SG&A	3	4	8	10	10	11	21	32	34	36	37	39	41	43	45	48	50
Operating Income	(5)	(6)	(23)	(32)	(37)	(39)	(50)	(35)	833	3335	7479	12471	17551	22718	27975	33323	37876
Interest & Other Income	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pretax Income	(5)	(6)	(23)	(32)	(37)	(39)	(50)	(35)	833	3335	7479	12471	17551	22718	27975	33323	37876
Income Taxes	0	0	0	0	0	0	0	(7)	167	667	1496	2494	3510	4544	5595	6665	7575
<i>Tax Rate</i>	0%	0%	0%	0%	0%	0%	0%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Net Income	\$ (5)	\$ (6)	\$ (23)	\$ (32)	\$ (37)	\$ (39)	\$ (50)	\$ (43)	\$ 999	\$ 4,002	\$ 8,975	\$ 14,966	\$ 21,061	\$ 27,261	\$ 33,570	\$ 39,987	\$ 45,451
Reported EPS	\$ (0.27)	\$ (0.24)	\$ (0.57)	\$ (0.76)	\$ (0.88)	\$ (0.91)	\$ (1.18)	\$ (1.25)	\$ 8.88	\$ 37.43	\$ 84.29	\$ 140.50	\$ 197.69	\$ 255.87	\$ 315.07	\$ 375.27	\$ 426.53
Reported Ordinary Shares Outstanding (MM)	17	26	41	42	42	42	42	42	42	42	42	42	42	42	42	42	42

Source: Company Reports & JonesTrading Estimates

IMPORTANT DISCLOSURES APPENDIX**Analyst Certification**

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Company Name	Disclosure(s)
Cassava Sciences, Inc.	4

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The appropriate rating is based off the estimated value of the stock over a forward 12-month period, including both share appreciation and anticipated dividends.

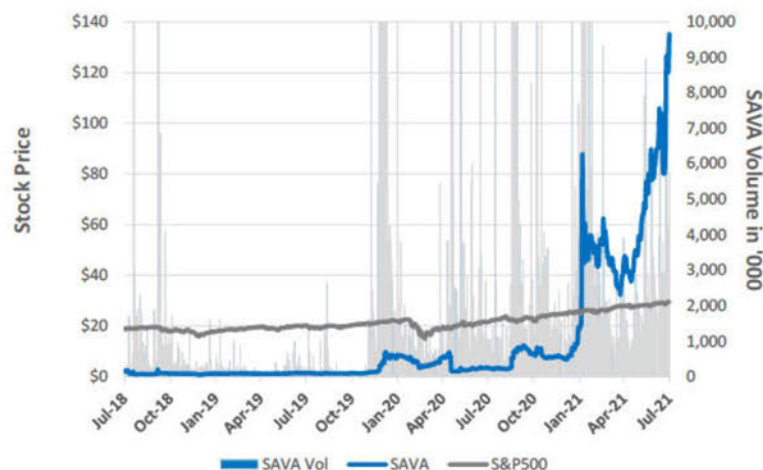
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Rating	JonesTrading Company Coverage		Investment Banking Services Within Past 12 Months	
	Count	Percent	Count	Percent
BUY	58	89%	26	45%
HOLD	6	9%	1	17%
SELL	1	1%	1	100%



Date:	Action:	Target Price:
March 17, 2021	Initiation of Coverage with a BUY rating	\$110.00
July 29, 2021	Raising PT, Maintaining BUY rating	\$215.00

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3. Concentration risk: Investing a substantial portion of assets in securities within a single industry or sector of the economy may be subject to greater price volatility or adversely affected by the performance of securities in that particular sector or industry.
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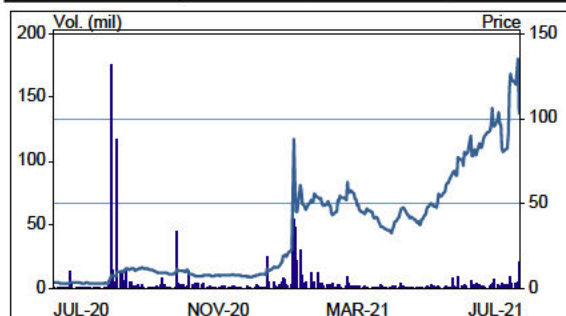
EXHIBIT 16

July 30, 2021

Cassava Sciences, Inc. (SAVA)
Rating: BuyVernon Bernardino
646-975-6954
vbernardino@hwcwresearch.com

Better Than Expected 9-Month ADAS-Cog Results; Reiterate Buy and \$124 PT

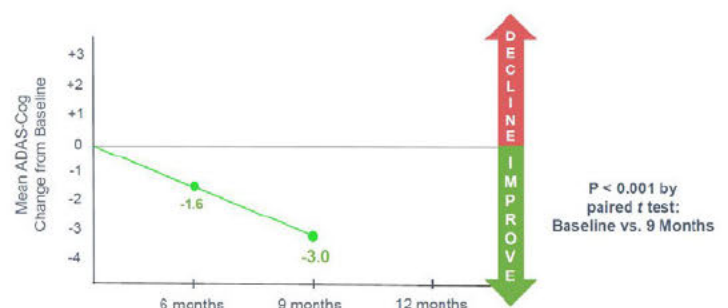
Stock Data		07/29/2021	
Price		\$103.35	
Exchange		NASDAQ	
Price Target		\$124.00	
52-Week High		\$146.06	
52-Week Low		\$2.78	
Enterprise Value (M)		\$3,853	
Market Cap (M)		\$4,135	
Public Market Float (M)		37.5	
Shares Outstanding (M)		40.0	
3 Month Avg Volume		2,657,410	
Short Interest (M)		4.42	
Balance Sheet Metrics			
Cash (M)		\$282.2	
Total Debt (M)		\$0.3	
Total Cash/Share		\$7.05	
EPS (\$) Diluted			
Full Year - Dec	2020A	2021E	2022E
1Q	(0.05)	(0.09)A	--
2Q	(0.05)	(0.12)	--
3Q	(0.06)	(0.18)	--
4Q	(0.09)	(0.39)	--
FY	(0.24)	(0.79)	2.07
Revenue (\$M)			
Full Year - Dec	2020A	2021E	2022E
1Q	0.0	0.0A	--
2Q	0.0	0.0	--
3Q	0.0	0.0	--
4Q	0.0	0.0	--
FY	0.0	0.0	200.0



Durable efficacy and disease-modifying potential demonstrated.

On July 29, Cassava Sciences presented positive nine-month cognition and six-month biomarker results from an ongoing open-label study with simufilam in patients with mild-to-moderate Alzheimer's Disease at the 2021 Alzheimer's Association International Conference (AAIC) that was held on July 26-29 2021 in Denver, Colorado. We believe results with simufilam, Cassava's small molecule, Phase 3-ready drug candidate for Alzheimer's disease (AD), suggest simufilam has potential to modify the course of Alzheimer's Disease (AD). More specifically, in a pre-planned interim analysis of safety and cognition data from the first 50 subjects who completed nine months of simufilam treatment in the open-label study, ADAS-Cog11 score (where a negative number is associated with cognitive improvement) improved from -1.6 at six months to -3.0 at nine months from baseline ($p < 0.001$, where a p value less than 0.05 is considered statistically significant). As AD is ultimately a progressive disease, and the effects of all AD drugs have been temporary, we believe the durability of results and cognitive improvement observed with simufilam, which beyond six months is uncommon in AD, suggest simufilam could be a transformative drug. We reiterate our Buy rating and \$124 PT, and with the pullback in the stock yesterday, believe Cassava shares represent an attractive buying opportunity.

Exhibit 1. ADAS-Cog Score With Simufilam Treatment



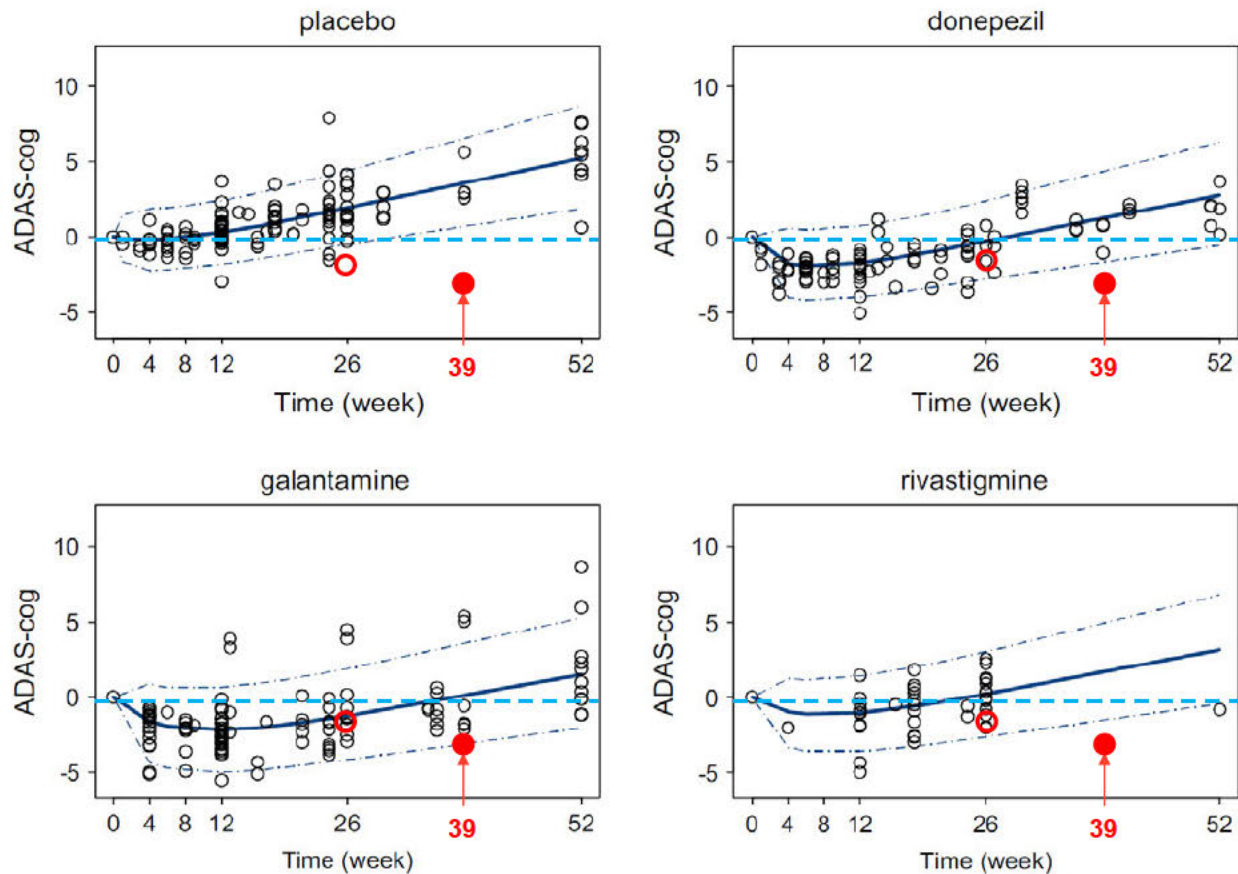
Source: Company reports.

Potential for durable cognitive improvement differentiates simufilam. Cognition outcomes suggest simufilam's treatment effects at nine months were broad based, with ADAS-Cog scores improved from baseline in 66% of patients ($n = 33$) and 22% of patients ($n = 11$) showing a decline less than expected, as given in the scientific literature (Ito, K. et al. Alzheimer's & Dementia (2010). Recall that we had noted 1.6 points of improvement in ADAS-Cog with simufilam treatment at six months as being on par with ADAS-Cog improvement observed at six months with the acetylcholinesterase (AChE) inhibitor, donepezil, currently the most commonly prescribed treatment for AD. In the second interim analysis, we believe the 3.0-point ADAS-Cog improvement observed with simufilam at nine-months appears better than ADAS-Cog improvement that may be expected at nine months in any modeling of a placebo effect, as well as cognitive improvement that may be observed with donepezil, and other AChE inhibitors like galantamine, and rivastigmine (see Exhibit 2 below). We believe these results differentiate simufilam from AChE inhibitors.

Simufilam reduced dementia-related behavior. Alzheimer's is often accompanied by behavior disorders, such as anxiety, agitation or delusions, which may become more frequent as the disease progresses. We think it notable that simufilam treatment had a positive effect on the Neuropsychiatric Inventory (NPI), a clinical tool widely used to measure changes in dementia-related behavior. More specifically, At baseline, 34% of study subjects had no neuropsychiatric symptoms. After six months of simufilam, 38% of study subjects had no neuropsychiatric symptoms. Finally, at month nine, over 50% of study subjects had no neuropsychiatric symptoms. The interim results were consistent with prior simufilam studies, suggesting that positive effects on behavior could represent another hallmark of real-life benefit with simufilam.

Simufilam restores cell signaling, and reverses neurodegeneration and neuroinflammation. Cassava also presented results that showed simufilam significantly improved all measured Alzheimer's disease-associated biomarkers in patients treated with six months of open-label simufilam. Recall that cerebrospinal fluid (CSF) biomarker data were collected from 25 patients with mild-to-moderate Alzheimer's disease who completed six months of simufilam treatment in the open-label study. CSF biomarkers of disease pathology, such as the core markers of AD, t-tau and p-tau181, decreased 38% and 18%, respectively (both $p < 0.00001$). In addition, as tau levels are elevated and amyloid beta42 ($A\beta_{42}$) is low in AD, we think it was notable that CSF $A\beta_{42}$ levels increased 84% ($p < 0.00001$), suggesting simufilam's effects on these biomarkers was through its novel mechanism of action, i.e., binding to altered filamin A (FLNA), which restores FLNA's proper shape and function, disabling $A\beta$ -associated dysfunctional signaling via alpha-7 nicotinic acetylcholine receptor ($\alpha 7nAChR$), and toll-like receptor 4 (TLR4)-associated inflammation. Further, CSF biomarkers of neurodegeneration, neurogranin and NfL, decreased 72% and 55%, respectively (both $p < 0.00001$). Lastly, CSF biomarkers of neuroinflammation, sTREM2 and YKL-40, decreased 65% and 44% (both $p < 0.00001$). As biomarkers are objective biological data that obviate any placebo effects, we believe the data suggest a potential correlation between simufilam's mechanism of action, effects on AD biomarkers, and efficacy as measured by ADAS-Cog.

Valuation and risks. Our \$124 PT is derived by using a weighted-average cost of capital of 13% for Cassava shares to discount free cash flows from our projection of annual sales of simufilam in Alzheimer's disease, and dividing them by our projected number of shares for each year to account for the effects of share dilution. We then factored in a 2% terminal growth rate, and a 65% clinical program probability of success. Investment thesis risks include failure of clinical trials to prove efficacy, regulatory requirements for additional clinical studies, assembling a commercialization team, failure to show competitive differentiation, intellectual property expiry or invalidation, and potential need to raise additional funds under poor market conditions. We look for the company to sign a lucrative, milestone payment-rich, non-dilutive simufilam development and commercialization agreement in late 2022.

Exhibit 2. ADAS-Cog With Simufilam vs. Models of Expected ADAS-Cog Time-Course

Notes: ADAS-Cog improvement from baseline (approximated by the blue dashed line) observed with six months (26 weeks) of simufilam treatment is marked (open red circle), where a positive score is a measure of cognitive decline, and a negative score, a measure of cognitive improvement. The same ADAS-Cog score with simufilam at six months is marked (solid red circle) at nine months (39 weeks) for the purpose of discussion.

Source: Ito, K. et al. *Alzheimer's & Dementia* (2010); 6: 39-53, company reports, and H.C. Wainwright estimates.

Financial Statements

Exhibit 1. Income Statement, Quarterly 2020A-2021E

Income Statement (Fiscal year ends December 31)												
(in \$MMs, except per share data)	2019A	1QA	2QA	3QA	4QA	2020A	1QA	2QE	3QE	4QE	2021E	2022E
Product Revenue (sumifilam in Alzheimer's)	-	-	-	-	-	-	-	-	-	-	-	-
Licensing, Milestone and Other Revenues	-	-	-	-	-	-	-	-	-	-	-	200.0
Royalty Revenue from sumifilam in Alzheimer's	-	-	-	-	-	-	-	-	-	-	-	-
Total Revenues	-	-	-	-	-	-	-	-	-	-	-	200.0
Cost of Sales & Marketing	-	-	-	-	-	-	-	-	-	-	-	-
Gross Profit	-	-	-	-	-	-	-	-	-	-	-	200.0
R&D Expense, Net	1.6	0.5	0.6	0.4	1.5	3.1	2.5	3.8	5.7	14.2	26.2	65.6
G&A Expense	3.4	0.7	0.6	1.0	1.1	3.4	1.0	1.2	1.3	1.5	5.0	6.3
Operating Expense	5.0	1.2	1.2	1.4	2.6	6.4	3.5	4.9	7.0	15.8	31.3	71.9
Operating Income (Loss)	(5.0)	(1.2)	(1.2)	(1.4)	(2.6)	(6.4)	(3.5)	(4.9)	(7.0)	(15.8)	(31.3)	128.1
Interest income	0.3	0.1	0.0	0.0	0.0	0.1	0.0	-	-	-	0.0	-
Interest and other expense	-	-	-	-	-	-	-	-	-	-	-	-
Other expenses	-	-	-	-	-	-	-	-	-	-	-	-
Pre-tax Income (Loss)	(4.6)	(1.2)	(1.1)	(1.4)	(2.6)	(6.3)	(3.5)	(4.9)	(7.0)	(15.8)	(31.2)	128.1
Tax (Benefit) Expense and others	-	-	-	-	-	-	-	-	-	-	-	30.8
Net Income (Loss)	(4.6)	(1.2)	(1.1)	(1.4)	(2.6)	(6.3)	(3.5)	(4.9)	(7.0)	(15.8)	(31.2)	97.4
EPS (diluted)	(\$0.27)	(\$0.05)	(\$0.05)	(\$0.06)	(\$0.09)	(\$0.24)	(\$0.09)	(\$0.12)	(\$0.18)	(\$0.39)	(\$0.79)	\$2.07
Weighted Average Shares	17.4	24.5	24.8	25.0	30.2	26.1	37.7	40.0	40.0	40.0	39.4	47.1

Source: Company reports and H.C. Wainwright & Co. estimates.

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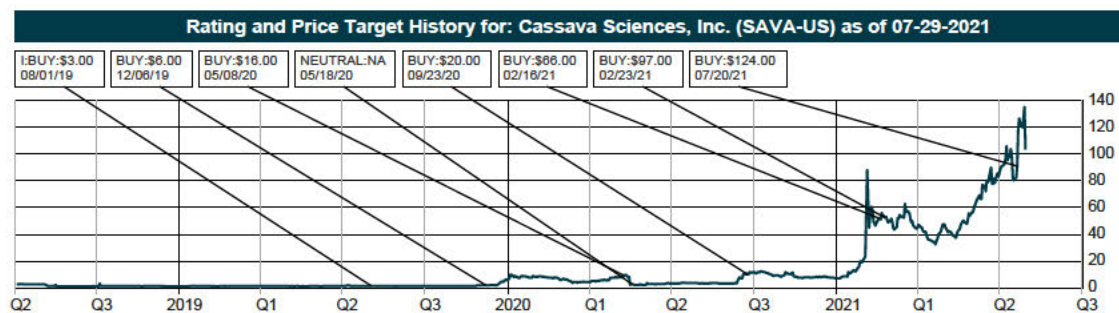
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Ratings	Count	Percent	IB Service/Past 12 Months	
			Count	Percent
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Neutral	51	9.04%	15	29.41%
Sell	1	0.18%	0	0.00%
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EXHIBIT 17

Staff Report on Equity and Options Market Structure Conditions in Early 2021



October 14, 2021

DISCLAIMER: This is a report of the Staff of the U.S. Securities and Exchange Commission. Staff reports, Investor Bulletins, and other staff documents (including those cited herein) represent the views of Commission staff and are not a rule, regulation, or statement of the Commission. The Commission has neither approved nor disapproved the content of these documents and, like all staff statements, they have no legal force or effect, do not alter or amend applicable law, and create no new or additional obligations for any person. The Commission has expressed no view regarding the analysis, findings, or conclusions contained herein.

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1. Introduction

GameStop Corp (“GameStop” or “GME”) and multiple other stocks experienced a dramatic increase in their share price in January 2021 as bullish sentiments of individual investors filled social media. As the companies’ share prices skyrocketed to new highs, increased attention followed, and their shares became known as “meme stocks.” Then, as the end of January approached, several retail broker-dealers temporarily prohibited certain activity in some of these stocks and options.

This report of the staff of the Securities and Exchange Commission (“SEC” or “Commission”) primarily examines the January 2021 trading activity in GME, the most famous of meme stocks against the backdrop of contemporaneous trading activity in other meme stocks. Because the media attention surrounding the meme stock episode raised several questions about market structure, this report will begin with an overview of U.S. equity and options market structure and explain how individual investors’ orders are typically handled.¹

As more individual investors participate in the markets, as many did during the volatile trading in early 2021, it is important to understand how their orders are executed and the incentives of their broker-dealers when executing those orders. In particular, the ability of a small number of off-exchange market makers to trade profitably with retail order flow has led these market makers to negotiate agreements with retail broker-dealers to secure rights to this order flow. In turn, this payment for order flow creates incentives with regard to the end customer whose order flow is being sold. Some individual investors might trade more frequently as commissions have fallen or been eliminated, which raises questions about the effect of novel features (e.g., digital engagement practices) of their broker-dealers. The execution of retail orders by off-exchange market makers raises further questions about whether individual investors may still be subject to other less conspicuous costs and conflicts of interest. While these features are not necessarily the cause of the meme stock volatility, investors should be mindful of how their orders are handled, including the difference between “free” and “no commissions.”

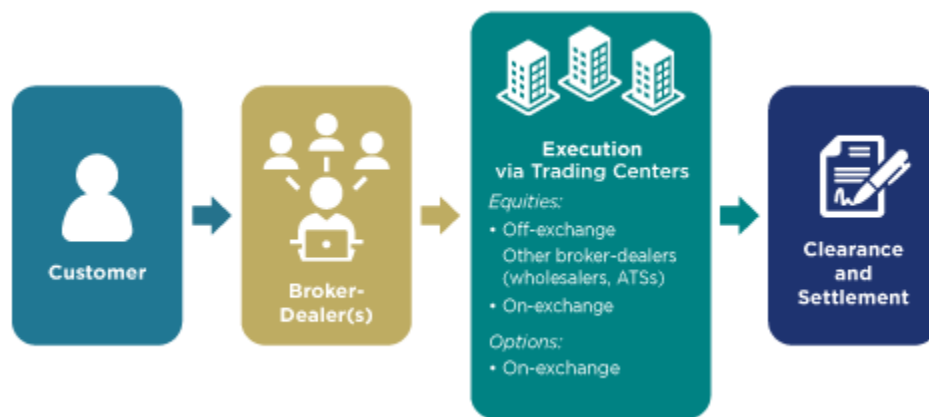
Dynamics related to short selling are also an integral part of the GameStop story. Stocks seen by parts of the market as overvalued tend to exhibit significant short interest, and prior to January 2021, GameStop was no different in this respect. However, some in the media directly

¹ This report uses the term “individual investor” to mean a natural person who is “self-directed” (i.e., not acting on a recommendation by a broker-dealer), in contrast with professional investors or institutional investors. The term encompasses an individual who trades frequently or infrequently and in very small to large dollar amounts. The term “retail broker-dealer” refers to a broker-dealer that caters to individual investors. This definition of “individual investor” differs from the Consolidated Audit Trail (“CAT”) definition of “individual customer account,” which is also used in this report. See infra note 59.

linked trading activity to the presence of short interest, characterizing trading in GameStop as an act of rebellion intended to humble short-selling professional investors who had allegedly targeted the stock. Lastly, the episode highlighted the risks that exist while trades are settled and raised concerns about the mechanisms market participants use to manage those risks. Specifically, volatility combined with settlement risks led some firms to temporarily restrict trading. We discuss aspects of equity and options market structure below.

2. U.S. Market Structure and Securities Regulatory Framework

2.1 *Equities and Options Market Structure*



To understand what transpired in January 2021, it is necessary to understand the market structure within which the events occurred.² From the perspective of individual investors, the lifecycle of a stock trade starts with an investor placing an order through an account they establish with a broker-dealer.³ The broker-dealer then routes the order for execution to a trading center, such as a national securities exchange, an alternative trading system (“ATS”), or an off-exchange market maker.⁴ Once a trading center executes the order, the customer receives

² See, e.g., “Staff Report on Algorithmic Trading in U.S. Capital Markets,” SEC Staff report (August 5, 2020), Sections II and X, available at: https://www.sec.gov/files/Algo_Trading_Report_2020.pdf.

³ Trading venues can have a wide variety of order types, but there are fundamentally two types: limit orders and market orders. Limit orders specify a price and will stay on an order book until an opposite order comes in that meets or beats that price. Alternatively, market orders are intended to be executed as soon as possible at the best available price.

⁴ Both ATSs and off-exchange market makers are also broker-dealers registered with the Commission under the Securities Exchange Act of 1934 (“Exchange Act”). Additionally, the first trading center a broker-dealer routes an order to may not execute the order and instead the order may get routed to one or more other trading centers.

a confirmation and the trade is reported to a securities information processor that collects, consolidates, and publishes the price and volume data to market data vendors and others. This processor will publicize the trade details (i.e., that the buyer and seller both report the same security, price, shares, and dollar amount). The trade details are also sent to the clearing broker, who affirms the trade by verifying the trade details. The clearing broker must “settle” an equity trade within two days of the trade date (called “T+2”) by officially moving the stock from the seller’s brokerage firm’s account to the buyer’s brokerage firm’s account and moving the money from the buyer’s brokerage firm to the seller’s brokerage firm, a process facilitated by clearing agencies registered with the Commission under the Exchange Act.

Options market structure is broadly similar to equities market structure with several key differences. Specifically, “standardized listed options” are traded only on a national securities exchange, there are a vastly larger number of securities listed and traded, displayed liquidity is primarily derived from market maker quotes, and options settle on the next business day following the trade (T+1). With respect to the number of series of options for each underlying security, there are more than 10,000 listed stocks in the National Market System (“NMS stocks”) and more than 1,000,000 options series.⁵ Because of the large number of series, there are less likely to be investor limit orders resting on an exchange’s order book in any one series at any given time, so prices are commonly set by registered market makers’ quotes.

2.2 Overview of the Regulatory Framework

The Commission’s mission is to protect investors, maintain fair, orderly, and efficient markets, and facilitate capital formation. In carrying out its mission, the Commission oversees self-regulatory organizations (“SROs”) such as the national securities exchanges, the clearing agencies, and the national securities associations (namely, the Financial Industry Regulatory Authority, or “FINRA”), all of whom act as regulators of their broker-dealer members.⁶ The

⁵ Options are listed according to a “class,” which represents the underlying security (e.g., ABC stock). Within each class, options are listed in series, which denote the options type (“call” or “put”), the strike price, and expiration date. For example, “ABC June \$50 calls” refers to a call option on ABC with a strike price of \$50 (giving the buyer the right, but not the obligation, to buy 100 shares of ABC stock at \$50 on the expiration date in June regardless of the then-current price of ABC stock). Options are priced differently than stocks, as they are expressed as the premium on a per share basis, such that an option with a quote of \$2 where one options contract represents 100 shares of underlying stock would cost \$200 in premium.

⁶ Among other things, the Commission also helps investors gain access to materially complete and accurate information about companies and the securities they offer and sell; oversees investment companies and investment advisers; and investigates and brings civil charges in federal district court or in administrative proceedings based on violations of the federal securities laws.

SROs are subject to the Exchange Act. The Exchange Act includes various rules, requirements, and principles, such as those that prohibit exchanges from engaging in unfair discrimination and require them to promote the protection of investors and the public interest, as well as those that require SROs to file all proposed rule changes with the Commission.

Broker-dealers generally must register with the Commission under the Exchange Act and are subject to the federal securities laws as well as rules of, and oversight by, the SROs of which they are a member. Generally, broker-dealers that deal with the public in securities must become members of FINRA.⁷ Broker-dealers are further subject to a number of regulatory requirements, both from the Commission and, as applicable, FINRA and exchanges of which they are a member, including customer account opening obligations, sales practices obligations, and net capital and other financial responsibility rules. A number of these rules and regulations impose obligations with respect to the handling of customer orders. Broker-dealers are subject to certain conduct requirements including the duty of “best execution,” which generally requires a broker-dealer to execute customer orders at the most favorable terms reasonably available under the circumstances, generally, the best reasonably available price.⁸ In addition, FINRA Rule 5320 (commonly referred to as the “Manning Rule”) generally prohibits FINRA members from trading ahead of customer orders (e.g., receiving a customer order to buy and then buying for its own account first at a price that would satisfy the customer’s order, without providing the customer with that price or better). Rule 605 and Rule 606 of Regulation NMS require public disclosures regarding order flow. Rule 605 requires a market center (i.e., exchanges, ATSs, and off-exchange market makers) to report data on the quality of executions on its market, while Rule 606 requires broker-dealers to make publicly available on a quarterly basis certain aggregated order routing disclosures for held orders.⁹

⁷ See, e.g., Section 15(b)(8) of the Exchange Act, 15 U.S.C. 79o(b)(8) (concerning membership in a registered securities association).

⁸ See “FINRA Reminds Member Firms of Requirements Concerning Best Execution and Payment for Order Flow,” FINRA Regulatory Notice 21-23 (June 23, 2021) (stating that “firms that provide payment for order flow for the opportunity to internalize customer orders cannot allow such payments to interfere with their best execution obligations[,]” and that “inducements such as payment for order flow and internalization may not be taken into account in analyzing market quality.”).

⁹ See *infra* note 41 (describing Rule 606(a)). See also Securities Exchange Act Release No. 84528 (November 2, 2018), 83 FR 58338, 58340 n.19 (November 19, 2018) (noting that, typically, a “not held” order provides the broker-dealer with price and time discretion in handling the order, whereas a broker-dealer must attempt to execute a “held” order immediately).

2.3 Individual Investors and Retail Broker-Dealers

Individual investors access the markets through accounts at broker-dealers.¹⁰ Broker-dealer customers can open “cash” accounts or “margin” accounts. With a cash account, the customer must pay the full amount for securities purchased. With a margin account, the broker-dealer loans the investor money with the securities in the investor’s account serving as collateral. Individual investors in a margin account can use this money to purchase securities, sell securities short, or cover transactions in case their available cash falls below zero (i.e., overdraft).¹¹

In order for a customer to trade options,¹² broker-dealers must conduct due diligence that options trading is appropriate for the individual customer. They often do this by requiring customers to obtain specific approval to open an options account, generally through completing an application that asks questions about the customer’s investing experience, financial situation, and risk tolerance.¹³ Depending on the customer’s responses, the broker-dealer may limit the customer to lower levels of options trading representing lower degrees of risk.¹⁴

Retail broker-dealers have attracted customers by reducing commissions and offering more tools, features, functionality, and convenience to transact. Some use promotional or award programs to attract and retain customers, like offering a free share of stock upon account opening, offering tiered credits for certain levels of deposits or for transferring an account from

¹⁰ See, e.g., “Investor Bulletin: How to Open a Brokerage Account,” SEC Office of Investor Education and Advocacy (June 10, 2021), available at <https://www.investor.gov/introduction-investing/general-resources/news-alerts/alerts-bulletins/investor-bulletins-43>.

¹¹ See, e.g., “Investor Bulletin: Understanding Margin Accounts,” SEC Office of Investor Education and Advocacy (June 10, 2021), available at <https://www.investor.gov/introduction-investing/general-resources/news-alerts/alerts-bulletins/investor-bulletins-29>.

¹² See, e.g., “Investor Bulletin: Leveraged Investing Strategies – Know the Risks Before Using These Advanced Investment Tools,” SEC Office of Investor Education and Advocacy (June 10, 2021), available at <https://www.investor.gov/introduction-investing/general-resources/news-alerts/alerts-bulletins/investor-bulletins-2>. See also Regulatory Notice 21-15, “FINRA Reminds Members About Options Account Approval, Supervision and Margin Requirements” (April 2021).

¹³ Pursuant to rules of FINRA, a registered national securities association, broker-dealers are required to make such approvals of any customer seeking to trade in options, prior to accepting an order from that customer to do so. See FINRA Rule 2360(b)(16) (Options). See also FINRA Regulatory Notice 21-15, “FINRA Reminds Members About Options Account Approval, Supervision and Margin Requirements” (April 2021).

¹⁴ “Investor Bulletin: Opening an Options Account,” SEC Office of Investor Education and Advocacy (March 18, 2015), available at <https://www.investor.gov/introduction-investing/general-resources/news-alerts/alerts-bulletins/investor-bulletins-77>.

another broker-dealer, referral programs, or promotions involving celebrities and online influencers. Some retail broker-dealers have focused on designing simple trading apps that make it easier to trade from anywhere. Some have “social” features that allow customers to discuss stocks and trades and display their trades and portfolios to others. A number of features, which broadly include behavioral prompts, differential marketing, game-like features, and other design elements or features, appear designed to engage individual investors. These features, which have the potential to leverage large amounts of user data, raise questions about their effect on investor behavior that the Commission explored in a recent request for public comment.¹⁵

Some brokers have sought to attract new customers by offering the ability to purchase fractional shares.¹⁶ Fractional shares give investors the ability to purchase less than 1 share of a stock.¹⁷ Fractional share programs are specific to each broker-dealer, as stocks do not trade on exchanges in units less than 1 share, and trades may only be reported to a trade reporting facility in multiples of one share.¹⁸

Many brokers have eliminated trading commissions and lowered or eliminated account minimums. While not the first broker-dealer to offer zero commissions, Robinhood Financial, LLC (“Robinhood”) attracted considerable attention when it launched its app, allowing users to

¹⁵ See Securities Exchange Act Release No. 92766 (August 27, 2021), 86 FR 49067 (September 1, 2021) (File No. S7-10-21) (Request for Information and Comments on Broker-Dealer and Investment Adviser Digital Engagement Practices, Related Tools and Methods, and Regulatory Considerations and Potential Approaches; Information and Comments on Investment Adviser Use of Technology to Develop and Provide Investment Advice).

¹⁶ A number of prominent stocks have share prices that have appreciated to several hundred or even several thousands of dollars per share. When that happens, investors with modest account balances can afford to purchase fewer shares than if the stock was priced below, say, \$50 per share. For example, an investor that has \$500 to invest could purchase 10 shares at \$50 per share, but cannot afford even a single share priced at \$1,500.

¹⁷ Broker-dealer fractional share programs typically involve the broker-dealer maintaining a separate account in which it either aggregates customers together to form a full share (e.g., one customer buys .25 and another buys .75), or uses its own capital to purchase/sell a full share and give its customer the fraction (e.g., one customer buys .25 and the firm puts the remaining .75 into the special account to satisfy future customer fractional orders). Customers generally cannot transfer these fractional shares to another broker-dealer. These programs vary by broker-dealer, and voting or proxy rights depend on the broker-dealer’s policies. See “Investor Bulletin: Fractional Share Investing – Buying a Slice Instead of the Whole Share,” SEC Office of Investor Education and Advocacy (November 9, 2020), available at: <https://www.sec.gov/oiea/investor-alerts-and-bulletins/fractional-share-investing-buying-slice-instead-whole-share>.

¹⁸ See “Trade Reporting Frequently Asked Questions #101.14,” FINRA, available at <https://www.finra.org/filing-reporting/market-transparency-reporting/trade-reporting-faq>.

trade stocks for no commissions with no account minimums.¹⁹ Other broker-dealers soon followed with apps offering no commissions and no minimums, including Webull Financial LLC,²⁰ and SoFi Securities LLC.²¹ By the fall of 2019, other broker-dealers began to announce zero-commission trading for individual investor customers, including Interactive Brokers LLC,²² TD Ameritrade, Inc.,²³ E*Trade Financial Corporation,²⁴ Ally Financial LLC,²⁵ Charles Schwab Corporation,²⁶ and Fidelity Investments Inc.²⁷

¹⁹ “Start Investing. Stop Paying.” Robinhood (March 12, 2015), available at: <https://blog.robinhood.com/news/2015/3/11/start-investing-stop-paying>.

²⁰ Press Release, “Webull Financial Launches Comprehensive Commission-free Stock Trading App,” Webull Financial LLC (May 30, 2018), available at: <https://www.prnewswire.com/news-releases/webull-financial-launches-comprehensive-commission-free-stock-trading-app-300656353.html>.

²¹ Press Release, “SoFi Announces Availability of SoFi Money and Invest Products to Help You Get Your Money Right,” Sofi Securities LLC (February 26, 2019), available at: <https://www.sofi.com/press/sofi-announces-availability-sofi-money-invest-products-help-get-money-right/>.

²² Press Release, “Interactive Brokers to Launch IBKR Lite New service to offer zero commissions and no fees,” Interactive Brokers Group, Inc. (September 26, 2019), available at: <https://investors.interactivebrokers.com/en/index.php?f=45393>.

²³ Press Release, “The Best Just Got Better: TD Ameritrade Introduces \$0 Commissions for Online Stock, ETF and Option Trades,” TD Ameritrade Holding Corporation (October 1, 2019), available at: https://www.tdainstitutional.com/content/dam/institutional/resources/press-releases/oct_1_pricing_press_release.pdf.

²⁴ Press Release, “#1 Digital Broker E*Trade Announces \$0 Base Rate Commissions For Online Stock, ETF, and Options Trades,” E*Trade Financial Corp. (October 2, 2019), available at: https://cdn2.etrade.net/1/19100221100.0/aempros/content/dam/etrade/about-us/en_US/documents/newsroom/press-releases/2019/5545607436705191.pdf.

²⁵ Press Release, “Ally Invest Joins the Zero Commission Movement,” Ally Financial Inc. (October 4, 2019), available at: <https://media.ally.com/2019-10-04-Ally-Invest-Joins-the-Zero-Commissions-Movement>.

²⁶ Press Release, “In Conjunction With Chuck Schwab’s New Book “Invested,” Schwab Removes the Final Pricing Barrier to Investing Online by Eliminating U.S. Stock, ETF and Options Commissions,” Charles Schwab & Co., Inc. (October 1, 2019), available at: <https://pressroom.aboutschwab.com/press-releases/press-release/2019/In-Conjunction-With-Chuck-Schwabs-New-Book-Invested-Schwab-Removes-the-Final-Pricing-Barrier-to-Investing-Online-by-Eliminating-U.S.-Stock-ETF-and-Options-Commissions/default.aspx>.

²⁷ Press Release, “Fidelity Becomes The Only Firm That Offers Zero Commission Online Trading, Automatic Default To Higher Yielding Cash Option For New Accounts And Leading Trade Execution,” Fidelity Investments (October 10, 2019), available at:

Though retail broker-dealers have reduced commissions, some have maintained or increased other sources of revenue, such as: (1) payment for order flow; (2) advisory services or managed accounts from broker-dealers that are dually registered as investment advisers or from affiliated investment advisers; (3) interest earned on margin loans and cash deposits; (4) income generated from securities lending; and (5) fees from additional services. Recent Commission enforcement actions have highlighted some of the conflicts faced by broker-dealers.²⁸

Some broker-dealers report that younger investors and smaller accounts have been notable sources of new account openings. For example, Charles Schwab indicated that individual investor customers age 40 and below, with account balances below \$100,000, are driving a greater percentage of trading volume than in prior periods.²⁹ Robinhood reported that its average customer is 31 years old and has a median account balance of \$240.³⁰ Apex Clearing

<https://clearingcustody.fidelity.com/app/literature/press-release/9896568/fidelity-becomes-the-only-firm-that-offers-zero-commission-online-trading-automatic-default-to-higher-yielding-cash-opt.html#:~:text=Insights-,Fidelity%20Becomes%20the%20Only%20Firm%20that%20Offers%20Zero%20Commission%20Online,to%20Investors%20of%20all%20Types>.

²⁸ See, e.g., In the Matter of Robinhood Financial, LLC, “Order Instituting Administrative and Cease-and-Desist Proceedings Pursuant to Section 8A of the Securities Act of 1933 and Section 15(b) of the Securities Exchange Act of 1934, Making Findings, and Imposing Remedial Sanctions and a Cease-and-Desist Order,” Securities Exchange Act Release No. 90694 (December 17, 2020) (“Robinhood Order”) (settled order), available at: <https://www.sec.gov/litigation/admin/2020/33-10906.pdf> (discussing the trade-off between payment for order flow and price improvement and how Robinhood took approximately a 20/80 split of the value between price improvement and payment for order flow, which was a substantially higher percentage to Robinhood than the typical 80/20 rate the principal trading firms paid to other retail broker-dealers); and In the Matter of Cantella & Co., Inc., “Order Instituting Administrative and Cease-and-Desist Proceedings, Pursuant to Section 15(b) of the Securities Exchange Act of 1934 and Sections 203(e) and 203(k) of the Investment Advisers Act of 1940, Making Findings, and Imposing Remedial Sanctions and a Cease-and-Desist Order,” Securities Exchange Act Release No. 92809 (August 30, 2021) (settled order), available at: <https://www.sec.gov/litigation/admin/2021/34-92809.pdf> (discussing revenue sharing payments in connection with cash sweep products).

²⁹ See, e.g., Past CFO Commentary, Charles Schwab & Co. (March 12, 2021), available at: <https://www.aboutschwab.com/cfo-commentary/mar-2021>.

³⁰ See, e.g., “Young, confident, digitally connected - meet America's new day traders,” Reuters (February 2, 2021), available at: <https://www.reuters.com/article/us-retail-trading-investors-age/young-confident-digitally-connected-meet-americas-new-day-traders-idUSKBN2A21GW>; and Testimony of Vladimir Tenev, Co-Founder and CEO of Robinhood Markets, Inc., at Sec. IV, Hearing Before the U.S. House Committee on Financial Services (February 18, 2021), available at:

Corporation, a broker-dealer that provides services to other broker-dealers, has indicated that the approximately 6 million accounts it opened in 2020 represent a 137% increase from the year before, with about 1 million of those accounts belonging to investors with an average age of 19.³¹

2.4 Order Execution and Segmentation of Individual Investor Flow

A myriad of market participants and trading venues facilitate the execution of equity and options orders. While customers set the terms of their orders, the retail broker-dealer generally controls where to route the order for execution, subject to a duty of “best execution,” discussed above.³²

For stocks, trades execute either “on exchange” (i.e., on one or more of 16 registered national securities exchanges that list and/or trade stocks, sometimes called “lit” exchanges) or “off exchange” (e.g., on one or more of 34 ATSS that trade NMS stocks or by off-exchange market makers).³³ Exchanges play a central role in price discovery, as the exchange quotes (composed of interest from registered market makers and displayed orders from non-market

<https://financialservices.house.gov/uploadedfiles/hhrg-117-ba00-wstate-tenevv-20210218.pdf>.

³¹ See, e.g., “Young, confident, digitally connected - meet America's new day traders,” Reuters (February 2, 2021), available at: <https://www.reuters.com/article/us-retail-trading-investors-age/young-confident-digitally-connected-meet-americas-new-day-traders-idUSKBN2A21GW>.

³² Customers can use “marketable” orders (i.e., an unpriced “market” order seeking an immediate execution at prevailing prices, or a “limit” order with a specified limit price that allows an immediate execution at prevailing prices) or “non-marketable” orders (i.e., an order whose limit price does not allow it to execute immediately but rather must wait until a contra-side order comes to trade with it).

³³ National securities exchanges must register with the Commission under the Exchange Act, but off-exchange market makers currently are not subject to specific registration requirements (though they must be registered as broker-dealers). While staff does not know the precise number of broker-dealers that hold themselves out as off-exchange market makers, staff understands from regulatory reports that the segment is highly concentrated with a few particularly dominant firms. See, e.g., *infra* note 41 (discussing Rule 606 reports).

makers) are the reference price for trades that execute off exchange.³⁴ Less than 60% of overall equities volume is typically executed on exchanges.³⁵

Retail brokers commonly send the orders of their individual investor customers to off-exchange market makers, one example of a practice called “segmentation.” For stocks, off-exchange market makers may execute individual investor orders by taking the other side of the trade principally (“internalizing” the trade) or may route the order to other trading venues for execution. For options, off-exchange market makers act as “consolidators” by purchasing individual investor options order flow. They cannot execute that flow off exchange because The Options Clearing Corporation (“OCC”) generally only accepts for clearing standardized listed options that traded on an exchange.³⁶ Instead, they choose the options exchange on which to execute the orders, perhaps based on where they (or an affiliate) are most likely to trade with the order as principal.³⁷

Off-exchange market makers have more flexibility compared to on-exchange participants because they are not subject to the rules of the exchanges on which they quote. For example, exchanges are required under Rule 612 of Regulation NMS to price displayed orders for stocks in penny increments, whereas wholesalers can execute more freely in sub-pennies when transacting off exchange. At the same time, off-exchange market makers use the public quotes submitted by on-exchange participants when setting the prices at which they execute individual investor orders off exchange.

³⁴ Stock prices are reflected in the best priced “bid” (order to buy, e.g., at \$10) and the best priced “offer” (order to sell, e.g., at \$10.05) resting on exchange order books. The difference between the bid and offer is known as the “bid-ask spread.” While each exchange has its own best bid and offer, all such prices across all exchanges collectively enter into the National Best Bid and Offer (“NBBO”).

³⁵ See, e.g., “U.S. Equities Market Volume Summary,” Cboe Exchange, Inc., available at: https://www.cboe.com/us/equities/market_share/.

³⁶ See, e.g., OCC Bylaws Article I.C(27) (defining “confirmed trade” as one that is “effected on or through the facilities of an Exchange” or “affirmed through the facilities of an OTC Trade Source”). See also “OTC Products,” OCC, available at: <https://www.theocc.com/Clearance-and-Settlement/Clearing/OTC-Products> (noting that OCC offers clearing services for OTC products on S&P 500 index options).

³⁷ Consolidators may be affiliated with, or have an arrangement with, an options market maker. Options exchanges offer consolidators the ability to “direct” orders to an affiliated market maker, and the market maker gets a guaranteed allocation (e.g., 40%) if they are quoting at the best price. Some options exchanges also offer “price improvement auctions,” in which a customer order can be exposed for price improvement over the published quotes.

Off-exchange market makers use segmentation to mitigate one of the key risks traders face—prices moving against their positions after executing a trade. Some in the marketplace may possess superior information about underlying asset values and will only buy when posted prices are low relative to their information, and sell when they are high. Other participants may, by virtue of greater quantities of data, have statistically greater predictive ability regarding the direction of prices. Because market makers are more likely to lose money when interacting with such order flow, they have an incentive to distinguish order flow that does not correlate with future price movements from order flow that does. The bid-ask spread, the difference between what a buyer is willing to pay and a seller willing to accept, normally compensates market makers for the risk that prices may move against them.³⁸ To the extent that market makers can segment order flow that is less correlated with future prices, they can offer a lower spread when trading with this order flow. Besides differing in the motive for trading, such orders are more likely to be small, uncorrelated with one another, and thus “one and done” (i.e., not the first in a series of orders intended to transact a large amount of stock), which also allows for a tighter spread.³⁹

Off-exchange market makers typically offer payment to the retail broker-dealer for the right to trade with its customer order flow (i.e., payment for order flow).⁴⁰ These payments can create a conflict of interest for the retail broker-dealer. In contrast to fees and rebates charged or paid by exchanges (discussed below), off-exchange payments are individually negotiated prior to

³⁸ See, e.g., Glosten, Lawrence R. and Paul R. Milgrom (1985), “Bid, Ask, and Transaction Prices in a Specialist Market with Heterogeneously Informed Traders,” *Journal of Financial Economics*, 14(1), 71-100.

³⁹ When evaluating price improvement, it is important to note that the NBBO displayed across exchanges does not include many of the best prices available on exchanges, such as odd lots and non-displayed orders. A significant amount of activity transacts at prices within the NBBO (even on exchanges). See Securities Exchange Act Release No. 90610 (December 9, 2020), 86 FR 18596 (April 9, 2021) (File No. S7-03-20) (adopting rule changes concerning a new round lot definition and including odd-lot quotations in core data, which, when implemented, will allow individual investors to see, and more readily access, better-priced quotations). While stocks can execute in a variety of ways, Rule 611 of Regulation NMS generally prevents stocks from executing at prices worse than the NBBO. Additionally, in order to avoid the risks of adverse selection, the smart order routers of executing brokers often break up a large order (often referred to as the parent order) into a number of smaller orders (often referred to as the child orders). A small order may thus be followed by a small order in the same direction, a situation which a market maker would like to avoid. Handling large volumes of orders also provides off-exchange market makers with enormous quantities of data that can be used to design and improve trading and risk management strategies.

⁴⁰ Payment for order flow is prevalent in the options market, potentially more so than in the equities market, but order flow that is purchased by consolidators is executed on exchange. See *supra* notes 36-37 and accompanying text.

trading between the retail broker-dealer and the off-exchange market maker,⁴¹ and the rates and amounts can vary substantially depending on the broker-dealer and its customer order flow. Off-exchange market makers may give the retail broker the choice of how to allocate those funds—either by applying some or all of that payment to improve the prices of its customers’ orders or by allowing the retail broker-dealer to keep part of the payment for itself.⁴²

Most exchanges offer a form of payment for order flow wherein they compensate firms that provide liquidity with rebates and charge firms that take liquidity.⁴³ For stocks, some exchanges have retail liquidity programs that allow special order types to interact only with designated “retail” orders, which may be supplemented by pricing incentives. For options, these come in the form of “marketing fees”⁴⁴ as well as transaction rebates. In contrast to wholesalers (as well as ATSSs), pricing incentives offered by equity and options exchanges are considered to be rules of the exchange, so these pricing incentives are subject to the filing requirements of the Exchange Act and must be publicly posted.

While stocks can execute in a variety of ways, Rule 611 of Regulation NMS generally prevents stocks from executing at prices worse than the NBBO. The Commission recently adopted rules that will materially improve the NBBO once those changes are fully implemented, including reducing the size of rounds lots for higher-priced shares and including some odd-lot

⁴¹ Rule 606(a) under the Exchange Act requires broker-dealers to make publicly available on a quarterly basis certain aggregated order routing disclosures for held orders that provide, among other things, detailed disclosure of payments received from or paid to certain trading centers and also requires a discussion of the material aspects of broker-dealers’ relationships with those trading centers, including a description of any arrangements for payment for order flow and any profit-sharing relationships and a description of any terms of such arrangements, written or oral, that may influence broker-dealers’ order routing decisions. See 17 CFR 242.606.

⁴² See, e.g., Robinhood Order, supra note 28 (discussing the trade-off between payment for order flow and price improvement and how Robinhood took approximately a 20/80 split of the value between price improvement and payment for order flow, which was a substantially higher percentage to Robinhood than the typical 80/20 rate the principal trading firms paid to other retail broker-dealers).

⁴³ These exchanges are known as “maker/taker” venues, wherein limit orders are paid a rebate by the exchange while market orders pay the access fee to the exchange. Alternatively, “taker/maker” venues give a rebate to market orders and charge limit orders the access fee.

⁴⁴ Generally speaking, marketing fees are collected by options exchanges from market makers when they trade with “customer” orders, pooled, and paid out by specified market makers to order flow providers to encourage them to send order flow to the exchange.

quotations in core data.⁴⁵ However, the availability, particularly for individual investors, of prices better than the national “best” bid (or offer, as applicable) highlights the limitations of relying on the NBBO as the reference point for measuring retail execution quality. For example, it does not include off-exchange liquidity or many of the best exchange prices, such as odd lots and non-displayed orders.⁴⁶ A significant amount of activity appears to transact within the NBBO (even on lit exchanges),⁴⁷ so price improvement statistics based on the NBBO may overstate the actual price improvement.

2.5 Clearance and Settlement

When retail broker-dealers restricted buying in certain stocks in January 2021, the clearing process, normally in the background, entered the public debate. Clearing agencies act as the central counterparty for almost all equities and options trades in the U.S. markets by functionally serving as the buyer to every seller and the seller to every buyer to lessen the risks associated with one counterparty to the trade failing to perform (i.e., deliver the securities or the money to pay for them).⁴⁸ This guarantee is particularly valuable when a stock is experiencing pronounced volatility in its price.⁴⁹ Registered clearing agencies are subject to a range of regulatory requirements, including those related to clearing member margin and capital.

Clearing agencies are essential to managing the risk of failure of trades to clear (i.e., the process of transmitting, reconciling, and in some cases, confirming transactions prior to settlement) and settle (i.e., the exchange of money for the securities involved in the trade). The

⁴⁵ See *supra* note 39 (citing to Release No. 34-90610 concerning recently adopted changes for a new round lot definition and including odd-lot quotations in core data).

⁴⁶ See *id.* (citing to Release No. 34-90610 concerning recently adopted changes for a new round lot definition and including odd-lot quotations in core data).

⁴⁷ See, e.g., “U.S. Exchanges Hidden Rate (%)” SEC, available at: https://www.sec.gov/marketstructure/datavis/ma_exchange_hiddenrate.html#.YPc78ehKgq8.

⁴⁸ There are two main types of registered clearing agencies: depositories and clearing corporations. Depositories—namely, The Depository Trust Company—hold securities certificates for their participants, transfer positions between participants, and maintain ownership records. Clearing corporations—such as the National Securities Clearing Corporation (“NSCC”)—often act as intermediaries in making securities settlements, comparing member transactions, clearing those trades, and preparing instructions for automated settlement of those trades.

⁴⁹ For example, if a buyer executes a trade at \$100 per share on Monday, but the price falls to \$20 on T+2, the buyer might regret the trade and seek to not follow-through with the purchase. The central counterparty guarantees the seller that the transaction will go through even if the buyer fails to perform.

clearing agency for the U.S. equities markets, NSCC, a subsidiary of the Depository Trust and Clearing Corporation (“DTCC”), maintains a “Clearing Fund” into which its member broker-dealers contribute margin to protect NSCC from potential losses arising from a defaulted member’s portfolio until it is able to close out that member’s positions. The Clearing Fund consists of required deposits posted by members in the form of cash and eligible securities. Typically, the largest portion of a member’s Clearing Fund requirement is the volatility component, which estimates the future risk of the cleared portfolio over a given time horizon at a 99th percentile level of confidence. To determine the volatility component for most securities, NSCC uses a parametric Value at Risk model based on historical price movements. While margin requirements typically change in response to broad-based market movement, the NSCC’s margin framework also allows for both intraday mark-to-market calls and additional special charges from clearing members if NSCC observes unusual volatility in specific securities that it believes would present heightened risk to the clearing agency and its members. Pursuant to its existing rules, NSCC can also impose excess capital premium (“ECP”) charges for members who present a degree of margin exposure for their cleared positions that exceed those members’ excess net capital. ECP charges are “designed to address significant, temporary increases in a Member’s Required Deposit based upon any one day of activity.”⁵⁰ To help members understand their potential required Clearing Fund deposit, NSCC provides certain calculators and information that allow members to monitor their risk and estimate their potential Clearing Fund requirements for actual or hypothetical portfolios.

Similarly, OCC is the clearing agency for listed options for its 16 participant options exchanges. OCC clears and settles listed options trades executed by its clearing members on a proprietary basis as well as for clients. In addition, OCC serves other financial markets, including the commodity futures, commodity options, security futures, securities lending, and the over-the-counter options markets.

3. GameStop: What Happened

3.1 The Run-Up to January 2021 and Increasing Individual Investor Participation

The underlying causes of the meme stock phenomenon that are unrelated to market structure are a subject of speculation that is beyond the scope of this report. Regardless of the causes, many individual investors traded in the meme stocks, which may reflect increases in

⁵⁰ See Securities Exchange Act Release No. 79598 (December 19, 2016), 81 FR 94462 (December 23, 2016) (SR-NSCC-2016-005) (Order Granting Approval of Proposed Rule Change to Accelerate its Trade Guaranty, Add New Clearing Fund Components, Enhance its Intraday Risk Management, Provide for Loss Allocation of “Off-the-Market Transactions,” and Make Other Changes).

investor participation in 2020 in both the equities⁵¹ and options markets.⁵² By early 2021, increasing numbers of individual investors were downloading apps for broker-dealers.⁵³

Against that backdrop, in January 2021, more than 100 stocks experienced large price moves or increased trading volume that significantly exceeded broader market movements. For some of these stocks, the amount of “short interest,” measured as the number of shares sold short

⁵¹ For example, off-exchange equities activity, a partial proxy for retail activity because retail orders are typically routed to off-exchange market makers and executed off exchange, continued to grow throughout 2020 with the 60-day moving average rising from 38.4% on March 23 to 46.5% at the end of the 2020 and the single day percentage exceeding 50% for the first time on December 23, 2020 at 50.4%. Source: Cboe Exchange, Inc. at https://www.cboe.com/us/equities/market_share/ and SEC Division of Trading and Markets (“TM”) staff calculations. In December 2020, over the counter non-exchange listed equity volume (including “penny” stocks) surged, with a daily average of nearly 50 billion shares, compared to roughly 14.7 billion shares per day in November 2020, which had been the most active month over the prior two years. Source: FINRA at <https://otce.finra.org/otce/marketStatistics>.

⁵² By the end of the first quarter of 2020, standardized listed options trading had grown to over 30 million contracts a day on average, more than 50% higher than the 19.6 million contracts per day traded in December 2019. Source: The Options Clearing Corporation for options data at <https://www.theocc.com/Market-Data/Market-Data-Reports/Volume-and-Open-Interest/Historical-Volume-Statistics> and TM staff calculations. Further, the percentage of options volume stemming from small trades of just one contract on 50 of the most-traded stocks had risen to 14% from 10% at the end of 2019 and retail broker-dealers reported large or record levels of options trades. See, e.g., “Free Trades, Jackpot Dreams Lure Small Investors to Options,” Wall Street Journal (June 24, 2020), available at: <https://www.wsj.com/articles/free-trades-jackpot-dreams-lure-small-investors-to-options-11592991000?shareToken=st8d4344fa898440e284dd8beb6951960d>. Further, the average size of electronic auctions fell by mid-2020 to six contracts per auction from around nine contracts, while the number of auctions per day grew by about 134%. See, e.g., “Q2 2020 Options Review: Record Volumes Continue,” NYSE (July 14, 2020), available at <https://www.nyse.com/data-insights/q2-2020-options-review>. Through the remainder of 2020, options volume remained high and ended the year at with an average of 34.3 million contracts trading per day in December 2020, the most active month of 2020, compared to a daily average of 24.5 million contracts in January 2020. Source: The Options Clearing Corporation at <https://www.theocc.com/Market-Data/Market-Data-Reports/Volume-and-Open-Interest/Historical-Volume-Statistics>.

⁵³ In January, reports mentioned a notable increase in broker-dealer app downloads, including Robinhood (more than 3 million) and Webull (more than 800,000). See, e.g., “Robinhood Appears to be Benefiting from the Trading Controversy, Seeing Record App Downloads,” CNBC (February 1, 2021), available at: <https://www.cnn.com/2021/02/01/robinhood-appears-to-be-benefiting-from-the-trading-controversy-seeing-record-app-downloads.html>.

as a portion of the total shares outstanding, exceeded the market average, while others had frequent mentions on social media, including Reddit. Notably, many of the stocks were consumer-focused companies that were familiar names to the public.

GME experienced a confluence of all of these factors: (1) large price moves, (2) large volume changes, (3) large short interest, (4) frequent Reddit mentions, and (5) significant coverage in the mainstream media. The price and volume movements in GME coincided with substantial interest expressed in certain online forums devoted to investing, including YouTube channels and the subreddit WallStreetBets. Some social media posts heavily touted the prospects for GME. Some of this discussion argued that GME was undervalued based on fundamental analysis and therefore constituted an attractive investment, while other discussion focused on its ability to transition to an e-commerce company. Alternatively, others contended that unusually high levels of short interest in GME presented the potential for a coordinated “short squeeze.”

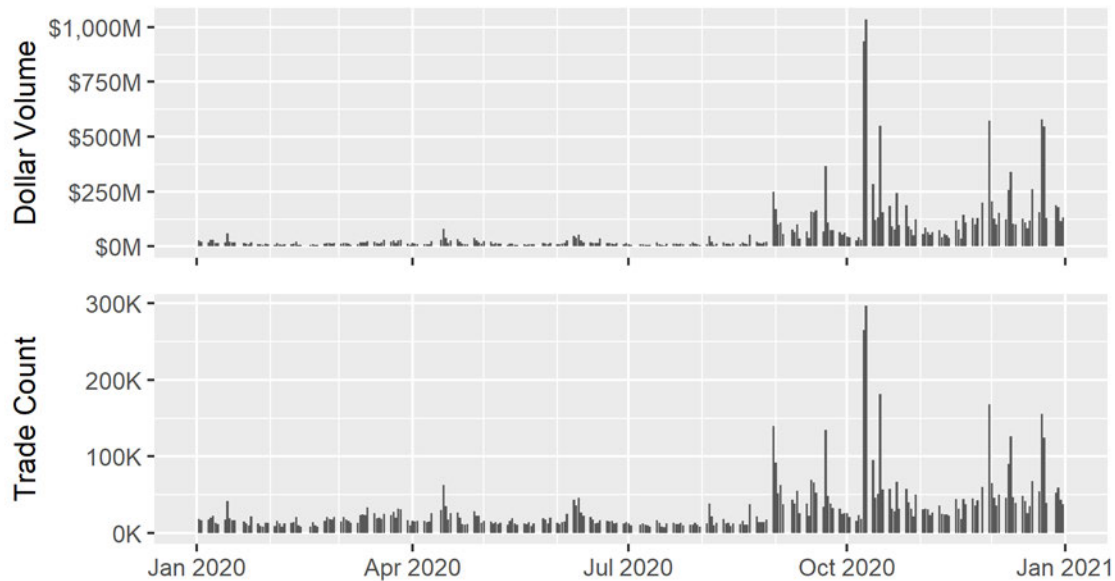
3.2 GME Equities Trading

GME’s stock exhibited substantial volatility throughout the prior year. At the start of 2020, GME was priced at just over \$6 per share. By April 2020, it had fallen by 50% to under \$3 per share. News about GameStop led to large swings in price and increased volume. For example, on August 31, 2020, Chewy, Inc. (“Chewy”) co-founder Ryan Cohen disclosed an investment in GameStop.⁵⁴ That day, GME’s share price closed up 23.93% over the prior day (\$6.68), with 38 million shares traded, totaling 34 million more than the prior day.⁵⁵ By the end of 2020, GME traded for a little under \$20 per share. GME’s closing price went from approximately the bottom 10th percentile to approximately the median over the course of the year.⁵⁶

⁵⁴ See Schedule 13-D filed on August 18, 2020 by RC Ventures LLC, available at <https://www.sec.gov/Archives/edgar/data/0001822844/000101359420000670/rc13d-082820.htm>.

⁵⁵ For all of 2020, GME’s average daily share volume was approximately 6.7 million shares per day. Source: NYSE TAQ.

⁵⁶ The standard deviation of daily closing price returns for GME in 2020 was 7.46%.

Figure 1**GME Daily Dollar Volume and Trade Count, 2020**

Source: NYSE TAQ

GameStop had already started to receive attention on Reddit in 2019, including in discussions about short squeezes. That attention grew throughout 2020. For instance, GME's short interest ratio of 84% was reportedly noted on Reddit in April 2020.⁵⁷

Price increases, trading interest, and social media interest all accelerated in 2021 (Figures 2 and 3). Media attention on GME increased with the January 11 announcement that Mr. Cohen, of Chewy, would join the GameStop board of directors.⁵⁸ That day, GME reached an intra-day high of \$20.65, approximately 17% above its prior day closing price. GME's price and volume began to increase noticeably on January 13, when the closing price rose to \$31.40 from \$19.95 the prior day, and the share volume rose to approximately 144 million shares, compared with approximately 7 million shares the day before. On January 22, 2021, the price of GME rose from \$43 to \$72 (a 71% increase) in approximately three hours. By January 27, GME closed at a high of \$347.51 per share, representing a more than 1,600% increase from its closing price on January 11. The following day, share prices jumped further to an intraday high of \$483.00. As the price increased, so too did the trading volume. From January 13-29, an average of approximately 100 million GME shares traded per day, an increase of over 1,400% from the

⁵⁷ See, e.g., "How WallStreetBets Pushed GameStop Shares to the Moon," Bloomberg (January 25, 2021), available at <https://www.bloomberg.com/news/articles/2021-01-25/how-wallstreetbets-pushed-gamestop-shares-to-the-moon>.

⁵⁸ See, e.g., "GameStop Soars With Activist Ryan Cohen Gaining Board Seats," Bloomberg (January 11, 2021), available at <https://www.bloomberg.com/news/articles/2021-01-11/gamestop-soars-with-activist-ryan-cohen-gaining-board-seats>.

2020 average. On January 22, 2021, the day of GME's highest share volume in the month, 197.2 million GME shares traded.

Overall, GME's intraday share price increased approximately 2,700% from its intraday low on January 8 to its intraday high on January 28, followed by a decrease of over 86% from that day to the closing price at the end of the first week of February. The daily closing price changes at the end of January were also highly volatile in dollar terms, ranging from a rise of \$199.53 (between January 26 and 27) to a fall of \$153.91 (between January 27 and January 28).

Figure 2

GME Closing Prices, January 2021

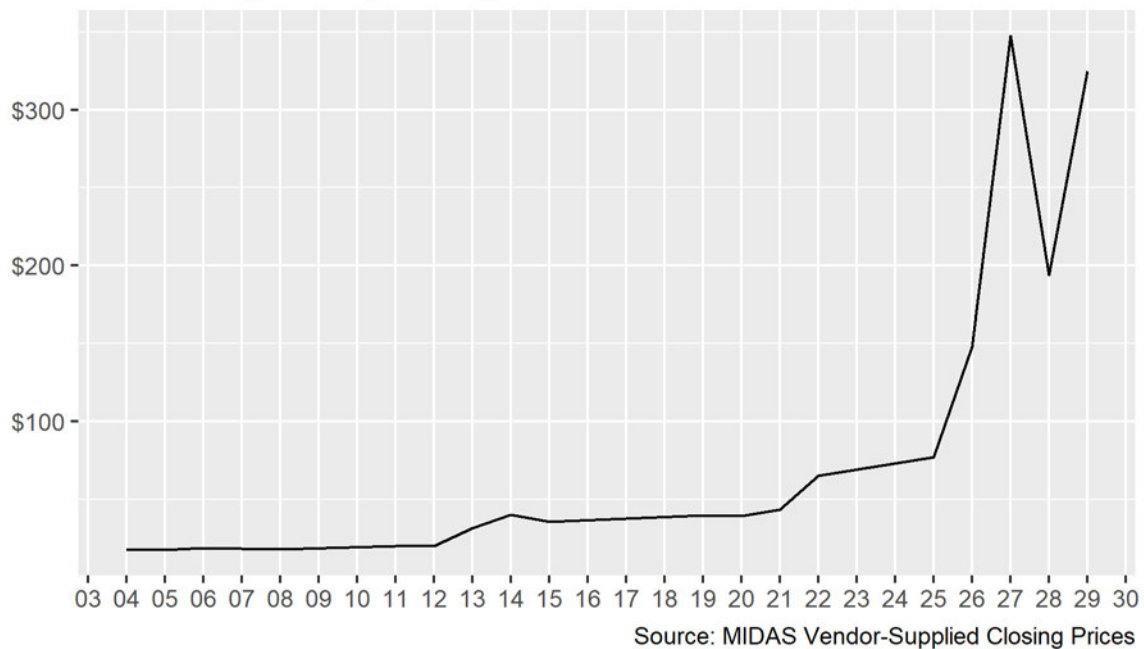
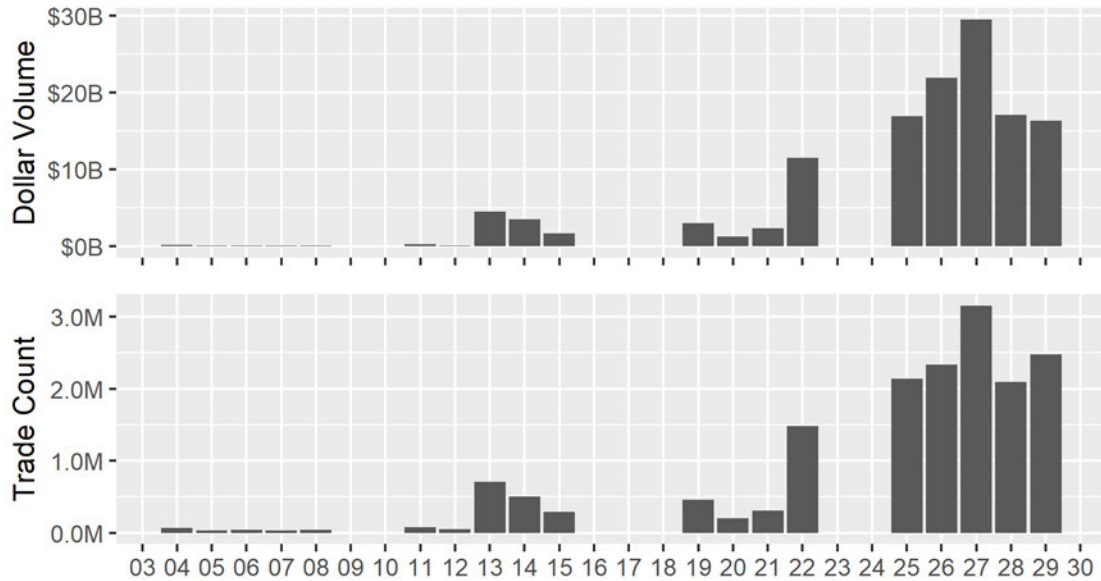


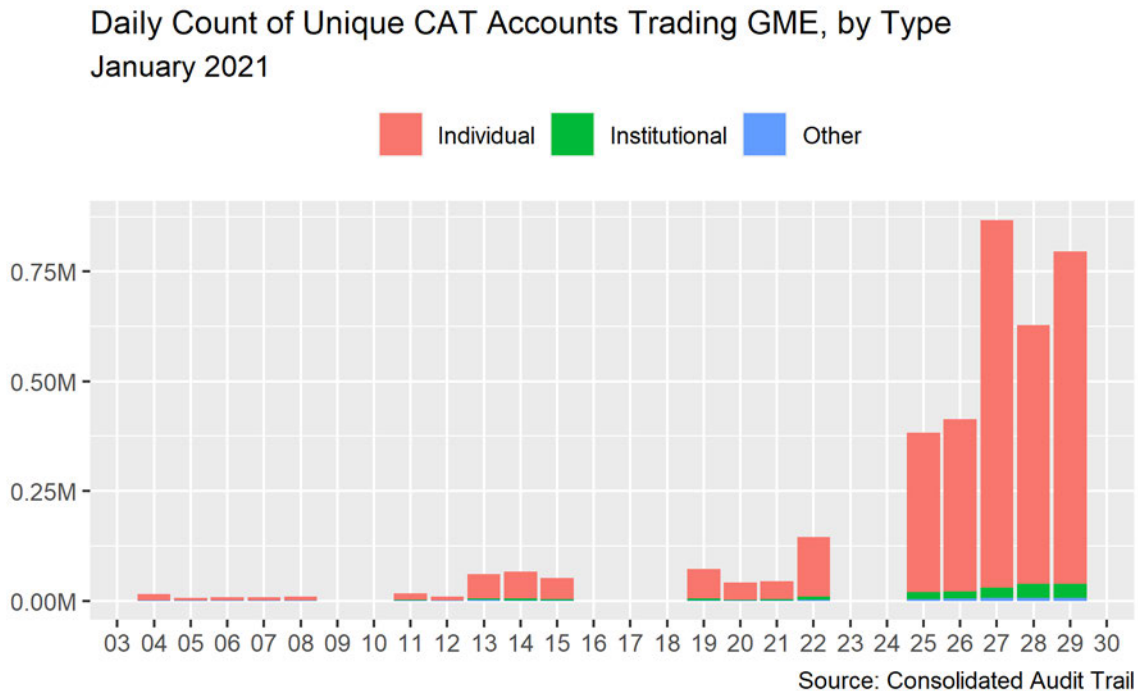
Figure 3**GME Daily Dollar Volume and Trade Count, January 2021**

Source: NYSE TAQ

The increases coincided with a sharp increase in the number of individual accounts actively trading GME.⁵⁹ As shown in Figure 4, below, by January 27, the number of unique accounts trading GME on a given day increased from less than 10,000 at the beginning of the month to nearly 900,000.⁶⁰

⁵⁹ For CAT purposes, “account” type definitions are available for the field name “accountHolderType” in Appendix G to the CAT Reporting Technical Specifications for Industry Members (<https://catnmsplan.com/>). Account types represent the beneficial owner of the account for which an order was received or originated. Possible types are: Institutional Customer, Employee, Foreign, Individual Customer, Market Making, Firm Agency Average Price, Other Proprietary, and Error. An institutional customer account is defined by FINRA Rule 4512(c) as a bank, investment adviser, or any other person with total assets of at least \$50 million. An individual customer account means an account that does not meet the definition of an “institution” and is also not a proprietary account.

⁶⁰ On January 13, 2021, the number of unique accounts trading GME, as reflected in the CAT, rose over 6 fold from the prior day, from 9,220 to 60,515.

Figure 4

Some institutional accounts had significant short interest in GME prior to January 2021.⁶¹ GME short interest (as a percent of float) in January 2021 reached 122.97%, far exceeding other meme stocks like Dillard's, Inc. (symbol: DDS) (77.3%), Bed Bath & Beyond, Inc. (symbol: BBBY) (66.02%), National Beverage Corp. (symbol: FIZZ) (62.59%), Koss Corp. (symbol: KOSS) (0.92%), Naked Brand Group, Ltd. (symbol: NAKD) (7.3%), and AMC Entertainment Holdings Inc. (symbol: AMC) (11.4%).

In addition to individual investor activity, there was significant participation by institutional investors, including several hedge funds that purchased GME. Some of those purchases may have been used, at least in part, to cover short positions. The potential of "buy-to-cover" volume to increase share prices, thus leading to further buys to cover is often referred to as a "short squeeze." The role a short squeeze may have played is discussed further below.

After peaking in late January, the volume of trading in GME shares and GME's price declined substantially. GME's decline coincided with several brokerages' decision to restrict trading in GME on January 28, discussed below. By February 3, GME's price was below \$100 per share, and fell as low as \$40.59 by February 19, still significantly above its January 4 closing price. GME's price rose back above \$100 at the end of February and has remained above that level since.

⁶¹ Through most of 2020, GME's short interest hovered around 100% as a percentage of public float.

By the end of January 2021, some funds had closed out their short positions in meme stocks, realizing significant losses.⁶² In contrast, some funds that were long GME saw significant gains.⁶³ Some investors that had been invested in the target stocks prior to the market events benefitted unexpectedly from the price rises,⁶⁴ while others, including quantitative and high-frequency hedge funds, joined the market rally to trade profitably.⁶⁵ Staff believes that hedge funds broadly were not significantly affected by investments in GME and other meme stocks. Staff did not observe that any advisers to private funds and registered funds experienced liquidity issues or difficulties with counterparties.

Yet while the swings in GME's share price and volume attracted significant attention, they were not unusual for January 2021. For instance, single-day price changes on January 27 from the closing prices on January 26 for KOSS (480.0%), AMC (301.2%), NAKD (252.3%), and Express, Inc. (symbol: EXPR) (214.1%) were larger than any single-day GME price change.⁶⁶ In fact, since 2020 began, 134 common stocks had at least one one-day price increase greater than GME's largest one-day price increase.⁶⁷

⁶² See, e.g., “‘We got lucky’: hedge funds that cashed in on the Reddit rally,” Financial Times (February 17, 2021), available at <https://www.ft.com/content/a883ad92-2fd8-454b-bc56-78b64ed20545>; and “Melvin Capital, hedge fund targeted by Reddit board, closes out of GameStop short position,” CNBC (January 27, 2021), available at <https://www.cnbc.com/2021/01/27/hedge-fund-targeted-by-reddit-board-melvin-capital-closed-out-of-gamestop-short-position-tuesday.html>.

⁶³ See, e.g., “‘We got lucky’: hedge funds that cashed in on the Reddit rally,” *supra* note 62; see also “This Hedge Fund Made \$700 Million on GameStop,” The Wall Street Journal (February 3, 2021), available at <https://www.wsj.com/articles/this-hedge-fund-made-700-million-on-gamestop-11612390687>.

⁶⁴ See, e.g., “‘We got lucky’: hedge funds that cashed in on the Reddit rally,” *supra* note 62.

⁶⁵ See, e.g., “Hedge Funds Beat the Stock Market Thanks to the Gamestop Saga,” Forbes (February 17, 2021), available at <https://www.forbes.com/sites/jacobwolinsky/2021/02/17/hedge-funds-beat-the-stock-market-thanks-to-the-gamestop-saga/?sh=60ccf298791a> (describing returns from one hedge fund index as compared to the broader stock market); see also “Glenview, Other Stock Funds Jump in January: Hedge Fund Update,” Bloomberg (February 2, 2021), available at <https://www.bloomberg.com/news/articles/2021-02-01/renaissance-quant-fund-slumps-9-5-in-january-stock-ructions> (describing varying hedge fund performance in January).

⁶⁶ Source: MIDAS vendor-supplied closing prices.

⁶⁷ Id.

3.3 Impact on Exchange-Traded Funds

The market events of January 2021 also affected some exchange traded funds (“ETFs”) and private funds. GME’s volatility was significant enough to impact ETFs that held GME stock. For example, the SPDR® S&P® Retail ETF (“XRT”) saw its position in GME increase from 1.5% of its portfolio as of December 31, 2020⁶⁸ to 19.98% of its portfolio on January 27, 2021.⁶⁹ That same day, XRT experienced net redemptions of \$506 million, representing 76.3% of its net assets, which was the second largest net redemption in the fund’s history. Over the three-day period ended January 28, 2021, XRT traded at an average bid-ask spread of \$0.073, compared to a 52 week average bid-ask spread of \$0.011.⁷⁰ In the same way, the Wedbush ETFMG Video Game Tech ETF (“GAMR”) position in GME increased from 2.04% of its portfolio as of December 31, 2020 to as much as 17% of its portfolio on January 28, 2021. Over the three-day period ended January 28, 2021, GAMR traded at an average bid-ask spread of \$1.32 compared to a 52 week average bid-ask spread of \$0.186.⁷¹ While this volatility raised questions about whether the market price of an impacted ETF’s shares might decouple from the ETF’s net asset value (“NAV”), staff observed that operations proceeded in a normal course for ETFs, despite heightened activity.⁷² For example, XRT’s closing price exhibited a premium of 1.25% to NAV on January 28, which is larger than its recent historical norms but does not seem

⁶⁸ See “SPDR® S&P® Retail ETF Semi-Annual Report,” State Street Global Advisors SPDR, (December 31, 2020), available at <https://www.ssga.com/us/en/institutional/etfs/resources/doc-viewer#xrt&semi-annual-report>.

⁶⁹ XRT seeks to track a modified equal weighted index where each of its holdings are roughly of similar size (as opposed to capitalization weighted where each holding’s proportion of the portfolio is determined by the market value of the company). As GME’s price increased, the size of the GME position held by XRT increased, as XRT did not rebalance its holdings during this time.

⁷⁰ Source: Bloomberg.

⁷¹ Id. During periods of extraordinary volatility in the underlying ETF holdings, it may be difficult for authorized participants or market makers to confidently ascribe precise values to an ETF’s holdings, thereby making it more difficult to effectively hedge their positions. Market participants might widen their quoted spreads in the ETF shares as a result.

⁷² ETFs do not sell or redeem individual shares. Instead, “authorized participants” purchase and redeem ETF shares directly from the ETF in blocks called “creation units” typically using a “basket” of securities and other assets identified by the ETF. The combination of the creation and redemption process with secondary market trading in ETF shares and underlying securities provides arbitrage opportunities that are designed to help keep the market price of ETF shares at or close to the NAV per share of the ETF. This arbitrage opportunity would exist if an ETF trades at a price that represents a premium (above) or a discount (below) its NAV.

indicative of a failure of the creation and redemption process or any other operational challenge beyond the observed volatility of its holdings.

3.4 Short Selling and Covering Short Positions⁷³

GameStop at the time was notable for its significant short interest (the ratio of shares currently sold short to shares outstanding).⁷⁴ Figure 5 shows GME's short interest over time, along with average levels of short interest among other non-financial common stocks. In the past, GME had several periods of high short interest, but none as high as the levels achieved from 2019 to mid-January 2021. GME short interest hit 50% of shares outstanding first in 2012 and then again in 2015, 2016, and 2018, before rising even further in 2019. From then until early

⁷³ Unless otherwise indicated, information in this subsection was derived from staff review of data maintained in the CAT database or obtained from Compustat, the Center for Research in Security Prices, LLC, ORTEX, and Bloomberg, as well as from the Nasdaq Stock Market LLC, New York Stock Exchange LLC, NYSE Arca, Inc., NYSE American LLC, and Cboe Exchange, Inc.

⁷⁴ Short selling involves the sale of a stock that the seller does not own. For example, if a stock has 100 shares outstanding and 5 of them are currently being sold short, then the stock would have short interest of 5%. Short selling is typically done: (1) when a person expects a stock to decline and borrows the stock from someone else to sell it at a current high price and later "cover" the sale by purchasing it at a lower price to give back to the lender; (2) by a market maker selling to a customer that wants to buy at a time when the firm does not have enough of the stock in its inventory to fill the customer's order; or (3) to hedge (i.e., reduce the economic exposure of) a long position in the same or a related security. Short selling is uniquely risky because stock prices can potentially rise indefinitely, in which case the short seller can lose more than the value of their original investment. Recognizing this risk, broker-dealers typically require that the short selling investor post collateral in a margin account of at least 50% of the shorted position in addition to the cash obtained from the short sale. Some issuers and individual investors have been vocal in their public criticisms of short selling. See, e.g., comments received in response to the Commission's proposed amendments to Regulation SHO, Securities Exchange Act Release No. 59748 (April 10, 2009), 74 FR 10842 (April 20, 2009), Comment File No. S7-08-09, available at: <https://www.sec.gov/comments/s7-08-09/s70809.shtml>. Nevertheless, short selling provides a financial incentive for individuals to uncover negative information (such as fraud), and can also act to dampen the boom/bust cycle, since shorts can reduce irrational exuberance when stocks are going up, and covering shorts acts as upward pressure on declining stocks. See, e.g., Vivian W. Fang, Allen H. Huang, and Jonathan M. Karpoff. "Short selling and earnings management: A controlled experiment." *The Journal of Finance* 71.3 (2016): 1251-1294, Robert F. Stambaugh, Yu Jianfeng, and Yu Yuan. "The short of it: Investor sentiment and anomalies." *Journal of Financial Economics* 104.2 (2012): 288-302.

2021, GME short interest hovered around 100%, hitting its high of 109.26% on December 31, 2020.

Some commentators have asked how short interest can get as high as it did in GameStop. Short interest can exceed 100%—as it did with GME—when the same shares are lent multiple times by successive purchasers. If someone purchases a stock from a short seller and subsequently lends the stock out again, it will appear as if the stock was sold short twice for the purpose of the short interest calculation.⁷⁵ Short interest ratios tend to be quite low; for large non-financial stocks, they are often less than 2.5% whereas for small non-financial stocks they still tend to be less than 13%. Few stocks, if any, have short interest greater than 50% on a given date.⁷⁶ Until recently, short interest of more than 90% was observed only a few times—in 2007 and 2008. When examining short interest as a percent of shares outstanding, GME is the only stock that staff observed as having short interest of more than shares outstanding in January 2021.

Given the high levels of short interest, together with the price movements in GameStop, a natural question is the degree to which these price movements arose from a “short squeeze.” Indeed, some of the meme stock trading was described in news coverage as an act of rebellion against short-selling professional investors who had targeted GameStop and other stocks. A short squeeze might occur when an event triggers short sellers *en masse* to purchase shares to cover their short positions. For example, if there is a sudden increase in the price of the stock being shorted, short sellers would face margin calls requiring them either to post additional collateral or to exit their position. Short sellers that cover their positions by buying the underlying stock would cause additional upward price pressure on the stock, which could force other short sellers to exit their positions, adding further upward price pressure and so on. Because short sellers are out of the market, at least temporarily, a stock price could continue to rise, unchecked by those who are pessimistic regarding its performance. Further, because short sellers could lose more than the capital they have invested, the extreme risk could deter further short selling in the stock. While the price of GameStop did eventually fall, one could ask to what extent a short squeeze lay behind its price increase dynamics.

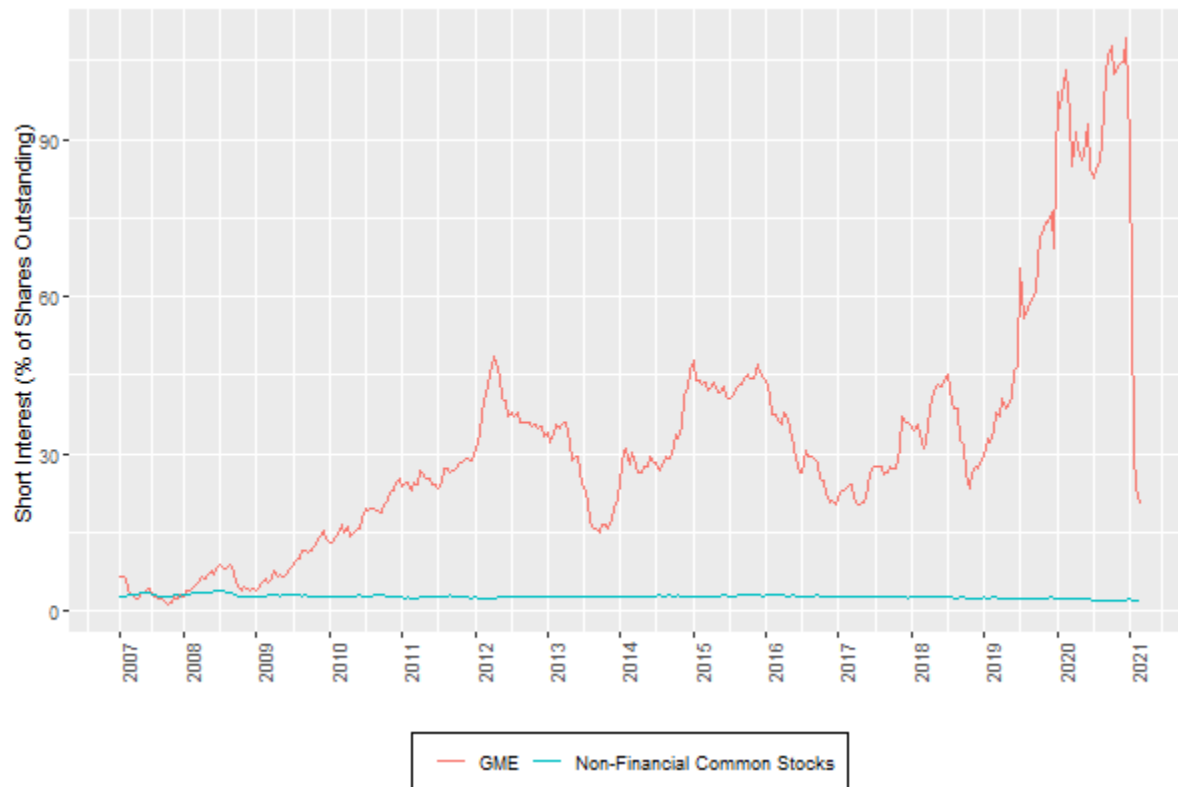
In seeking to answer this question, staff observed that during some discrete periods, GME had sharp price increases concurrently with known major short sellers covering their short positions after incurring significant losses. During these times, short sellers covering their positions likely contributed to increases in GME’s price. For example, staff observed that

⁷⁵ Suppose that a stock has 100 shares outstanding and one is sold short. The stock will have a short interest ratio of 1%. If the individual who purchases the share from the short seller then lends it out, there will be two investors with a short position based on the same share. That is, there will be one share sold short twice, and so short interest will be 2%, even though 99 of the 100 shares are not being sold short. If this process occurs enough times, then short interest can exceed 100%.

⁷⁶ For example, during the significant market turbulence in 2008, 12 stocks had short interest of more than 50% on a single record date.

particularly during the earlier rise from January 22 to 27 the price of GME rose as the short interest decreased. Staff also observed discrete periods of sharp price increases during which accounts held by firms known to the staff to be covering short interest in GME were actively buying large volumes of GME shares, in some cases accounting for very significant portions of the net buying pressure during a period. Figure 6 shows that buy volume in GME, including buy volume from participants identified as having large short positions, increased significantly beginning around January 22 and remained high for several days, corresponding to the beginning of the most dramatic phase of the run-up in GME's price.

Figure 6 shows that the run-up in GME stock price coincided with buying by those with short positions. However, it also shows that such buying was a small fraction of overall buy volume, and that GME share prices continued to be high after the direct effects of covering short positions would have waned. The underlying motivation of such buy volume cannot be determined; perhaps it was motivated by the desire to maintain a short squeeze. Whether driven by a desire to squeeze short sellers and thus to profit from the resultant rise in price, or by belief in the fundamentals of GameStop, it was the positive sentiment, not the buying-to-cover, that sustained the weeks-long price appreciation of GameStop stock.

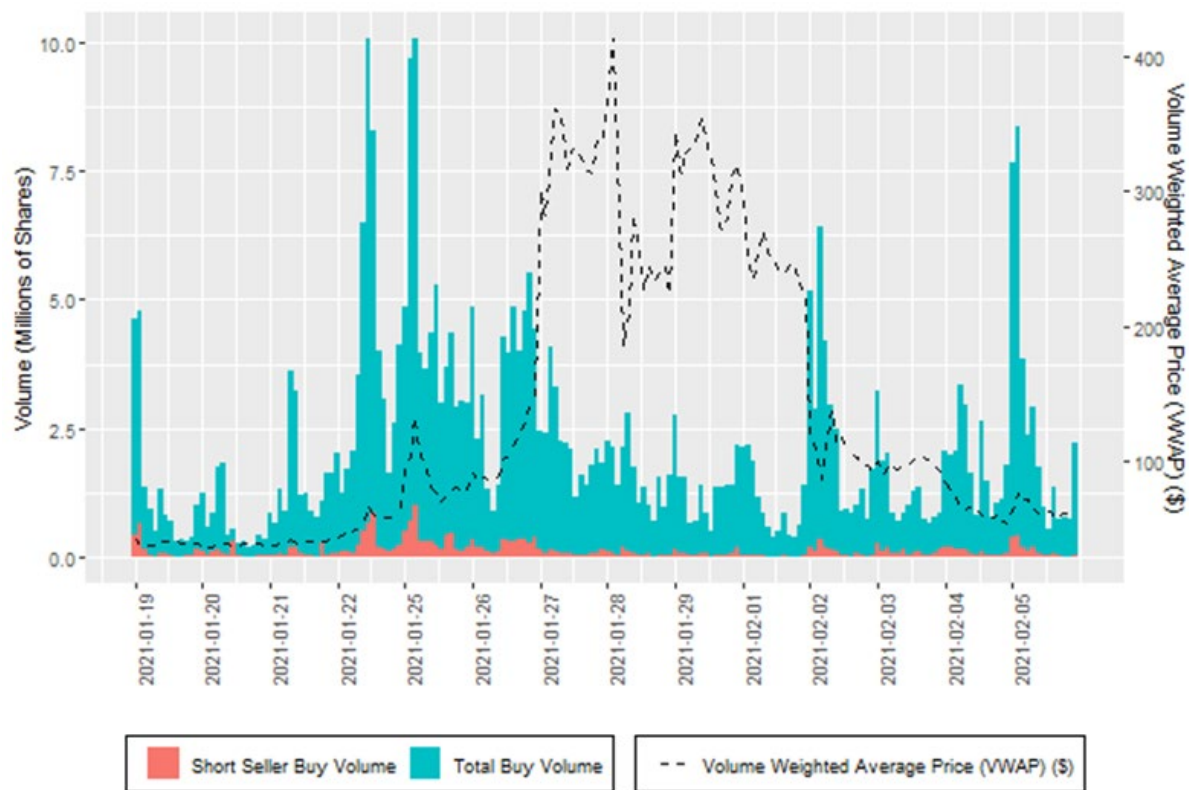
Figure 5Short Interest in GameStop vs. Market, Jan. 2007 – Feb. 2021⁷⁷

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This figure captures the short interest ratio for GME as compared to the weighted average short interest ratio for other non-financial common stocks for the period from January 2007 to February 2021. We estimate the short interest ratio for each stock as the number of shares in short interest reported by the exchanges on a bi-weekly basis and obtained from the Compustat North America Supplemental Short Interest File (for NYSE- and Nasdaq-listed stocks), divided by shares outstanding obtained from the Center for Research in Security Prices, LLC (CRSP) daily stock files. Since short interest is reported as of the settlement date, we match short interest to the trading date two days prior to the short interest report date. The sample includes non-financial (i.e., excluding stocks with SIC code between 6000 and 6999), common (i.e., CRSP share code of 10 or 11) common stocks. Following Blocher & Ringgenberg (2019), we exclude stocks whose short interest ratio and adjusted short interest ratio (where the adjusted short ratio is adjusted for stock splits, buybacks, etc.) differ by more than 10%, in order to exclude potential asynchronous adjustments for stock splits in the shares outstanding and short interest datasets. Further, stock-date observations for which a stock has multiple *gvkey*'s (Compustat identifier) or *permno*'s (CRSP identifier) per date are removed. For the group of non-financial common stocks, we take the value-weighted average short interest ratio within a group, using market capitalization as weights. Market capitalization is calculated as shares outstanding multiplied by the closing price (obtained from the CRSP daily stock files) two days prior to the short interest record date.

Figure 6

Buying Activity of Traders with Large Short Positions in GameStop,
Jan. 19 – Feb. 5, 2021⁷⁸



See Blocher, Jesse and Ringgenberg, Matthew C., Short Covering (February 11, 2019), available at: <https://ssrn.com/abstract=2634579>.

⁷⁸ This figure shows the total buy volume during half-hour intervals from January 19 to February 5, 2021, of traders identified as having a large short position in GME, along with total buy volume and the value-weighted average stock price, using data from CAT. We identify traders with large short positions by first calculating traders' average inventory positions as of January 15, 2021, and isolating the Firm Designated IDs ("FDIDs") with an average negative position, excluding market makers and high frequency traders (i.e., identified as traders that offset their trades within a day). We then isolate the FDIDs with negative inventories below (i.e., more negative than) the median as our sample of heavily shorted traders. We then identify the buy trades initiated by these FDIDs over the next two weeks (January 19 – February 5). Note that since the CAT sample only begins on December 24, 2020, we are not able to include FDIDs' inventory positions accumulated prior to this date. Value-weighted average stock prices are obtained from TAQ.

Another possible explanation could be a “gamma squeeze,” which occurs when market makers purchase a stock to hedge the risk associated with writing call options on that stock, in turn putting further upward pressure on the underlying stock price. As noted above, though, staff did not find evidence of a gamma squeeze in GME during January 2021. One of the main drivers of a gamma squeeze is an influx of call option purchases, which causes market makers to hedge their writing of the call options by purchasing the underlying stock, driving up the stock price in the process. While staff did find GME options trading volume from individual customers increased substantially, from only \$58.5 million on January 21 to \$563.4 million on January 22 until peaking at \$2.4 billion on January 27, this increase in options trading volume was mostly driven by an increase in the buying of put, rather than call, options. Further, data show that market-makers were buying, rather than writing, call options. These observations by themselves are not consistent with a gamma squeeze.

The unusually high amount of short selling raised the question of whether some of the short sales were “naked”—namely, made without arranging to borrow the underlying security.⁷⁹ When a naked short sale occurs, the seller fails to deliver the securities to the buyer,⁸⁰ and staff did observe spikes in fails to deliver in GME. However, fails to deliver can occur either with short or long sales, making them an imperfect measure of naked short selling. Moreover, based on the staff’s review of the available data, GME did not experience persistent fails to deliver at the individual clearing member level. Specifically, staff observed that most clearing members were able to clear any fails relatively quickly, i.e., within a few days, and for the most part did not experience fails across multiple days.⁸¹

Finally, as discussed above, the volatility in GME impacted some ETFs due to their holdings in GME, and potential short interest in the ETFs themselves. The most notable of these was XRT, an ETF of retail companies. XRT garnered attention in the press and on Reddit due to a combination of its GME exposure and its pre-existing short interest, which was several

⁷⁹ In a “naked” short sale, the seller does not borrow or arrange to borrow the securities in time to make delivery to the buyer within the standard two-day settlement period. As a result, the seller fails to deliver securities to the buyer when delivery is due. Because direct measures of naked short selling do not exist, fails to deliver can be used to learn about naked short selling. Naked short selling can have negative effects on the market. For example, fraudsters may use naked short selling as a tool to manipulate the market, which is illegal. In this regard, the Commission in 2008 adopted Rule 10b-21, a naked short selling antifraud rule.

⁸⁰ A “fail to deliver” or “fail” is when the seller fails to deliver securities to the buyer when delivery is due. Short selling has long been subject to regulation in this regard. For instance, Regulation SHO requires broker-dealers to properly mark sale orders as “long” or “short” (Regulation SHO Rule 200), to locate a source of shares prior to effecting a short sale (also known as the “locate” requirement in Regulation SHO Rule 203), and to close out fails to deliver that result from long or short sales (Regulation SHO Rule 204).

⁸¹ Staff conducted this analysis using data provided by the NSCC.

multiples of XRT's shares outstanding.⁸² As GME increased in value, price changes in XRT became increasingly driven by those of GME. Shorting XRT could have served as an indirect, though imperfect, way of shorting GME. In fact, staff observed a large spike in net redemptions of nearly 6 million shares in XRT on January 27, which may be consistent with short selling activity.⁸³ This redemption activity was generated nearly entirely by ETF market making firms. It therefore was likely the result of net selling of XRT by market participants against market makers (e.g., market makers buying from investors selling short) where the market makers, rather than offsetting those purchases, subsequently redeemed the XRT shares from the ETF sponsor for shares of the underlying stocks. Such shorting could have led XRT to trade either at a premium or discount relative to its NAV depending on market dynamics. As noted above, XRT's closing price exhibited a premium of 1.25% to NAV on January 28, which is larger than its recent historical norms but does not seem indicative of a failure of the creation and redemption process or any other operational challenge beyond the observed volatility of its holdings. It is noteworthy, therefore, that the price of XRT remained close to its NAV during this period. Differential costs of shorting were insufficient to overcome the ability to arbitrage the price/NAV differential, as the creation and redemption process through authorized participants continued to function, which helped keep the ETF's share price close to its NAV.

The price surge in GME also raises questions of market efficiency that relate to short selling. Staff have observed that it was unusually costly to borrow shares in GME.⁸⁴ Academic research implicates constraints on short selling as a possible contributor to bubbles where stock prices rise above what may be justified by fundamentals.⁸⁵ Such constraints on short selling could arise from cost or from risk aversion. To the extent that GameStop was costly and risky to short, the reluctance to sell short could have contributed to the run-up in prices and the subsequent steep decline. While a short squeeze did not appear to be the main driver of events,

⁸² See, e.g., "The most shorted securities in the world aren't stocks," Quartz (February 5, 2021), available at: <https://qz.com/1968231/retail-etf-with-highest-short-interest-was-blown-up-by-gamestop/>; and "Investors dump State Street ETF after GameStop weighting surges," Financial Times (January 28, 2021), available at: <https://www.ft.com/content/3d9c8383-a083-44a3-9c7e-54bb36c95a51>.

⁸³ Staff derived this information using data provided by the NSCC.

⁸⁴ Even when a share can be borrowed, short sellers may find it costly to borrow stock to enter or maintain a short position. This cost is known as a securities lending fee, or simply a "lending fee." During the second quarter of 2020, the cost to borrow GME was greater than 100%. This is an exceptionally high cost to borrow. Cost to borrow GME declined to under 50% by June 2020. For perspective, between January 2007 and July 2018, the securities of just 222 firms had lending fees greater than 100% at any point, accounting for just 0.01% of observations. Average lending fees were 1.5% during that same period. Lending fees to borrow GME were around 25% in January 2021 and fell as short interest began to decline into February 2021.

⁸⁵ See Harrison and Kreps, 1978, "Speculative Investor Behavior in a Stock Market with Heterogeneous Expectations," Quarterly Journal of Economics 92, 323-36.

and a gamma squeeze less likely, the episode highlights the role and potential impact of short selling and short covering.

3.5 Clearing Agency Margin and Capital Issues

Clearing agencies (i.e., NSCC and, to a lesser extent, OCC) played important roles during the January 2021 GME market events. The risk management mechanisms of these clearing agencies effectively led others in the transaction chain—such as retail broker-dealers—to pause and manage the risk exposure that arose as the rate of transactions accelerated. Both NSCC and OCC experienced record volumes cleared on January 27, 2021. After the market events of late January 2021, both NSCC's and OCC's margin requirements returned to prior and more historically consistent levels.

As mentioned above, in highly volatile trading where share prices whipsaw by hundreds of dollars, NSCC may require more margin to guard against an increased risk of defaults (which may occur if, for example, buyers do not carry-through on paying for a stock that has plummeted or sellers do not carry-through on delivering a stock that has skyrocketed). On January 27, 2021, in response to market activity during the trading session, NSCC made intraday margin calls from 36 clearing members totaling \$6.9 billion, bringing the total required margin across all members to \$25.5 billion. Of the \$6.9 billion, \$2.1 billion were intraday mark-to-market calls, while the remaining \$4.8 billion was a special ECP charge. Specifically, NSCC observed unusual volatility in certain securities, including GME, which presented heightened risk to the clearinghouse and its members.⁸⁶ As a result, it calculated and assessed against certain affected members the remaining \$4.8 billion as an additional special charge pursuant to its established rules. NSCC imposed this charge on 18 members, all of whom provided the additional margin. NSCC subjected one additional member to the special charge, but that member ultimately did not have to meet that charge after offsetting its exposure with a transfer from an affiliate.

In addition, several NSCC members were subject to an ECP charge based on the ratio of the excess risk in their portfolios relative to their capital. Because these members' ratios of excess risk versus capital were not driven by individual clearing member actions, but by extreme volatility in individual cleared equities, NSCC exercised its rules-based discretion to waive the ECP charge for all members on January 28, 2021. Absent this waiver, one retail broker-dealer would have had an additional ECP charge of more than double its margin requirement of \$1.4 billion on January 28, 2021. NSCC removed this waiver on February 2, 2021, meaning that any

⁸⁶ See Letter from Michael C. Bodson, President and Chief Executive Officer of DTCC, to the Honorable Patrick McHenry, Ranking Member on the Committee on Financial Services for the U.S. House of Representatives, dated February 18, 2021, available at: <https://www.dtcc.com/-/media/Files/PDFs/DTCC-Statement-February-2021-Mike-Bodson.pdf>.

member whose ratio of excess risk versus capital incurred an ECP charge would have been obligated to pay the charge going forward.

OCC margin requirements followed a similar pattern to those at NSCC, although OCC did not take any non-routine actions to increase financial resources during this period.

NSCC, like most similar central counterparties, does not instruct its member firms to stop trading or clearing individual symbols because its rules do not give it that ability. However, as discussed below, some broker-dealers restricted activities in a limited number of individual stocks in reaction to margin calls and capital charges imposed by NSCC. This would be a decision made by the broker-dealers and not directed by NSCC.

3.6 Broker-Dealer Reactions and Trading Restrictions

In their customer account agreements, some broker-dealers reserve the right to decline customer orders or cancel trades without prior notice. Such actions could be taken, for example, for legal, compliance, or risk management reasons.⁸⁷ As GME and other meme stocks experienced increased levels of volatility, some broker-dealers with a largely individual investor customer base restricted some types of trading⁸⁸ by their customers in those stocks.⁸⁹

One narrative at the time attributed the broker-dealer trading restrictions to pressure from hedge funds and their commercial partners (e.g., the wholesalers and consolidators) for the

⁸⁷ See, e.g., “Thinking About Investing in the Latest Hot Stock?,” SEC Office of Investor Education and Advocacy (January 30, 2021), available at: <https://www.sec.gov/oiea/investor-alerts-and-bulletins/risks-short-term-trading-based-social-media-investor-alert>.

⁸⁸ For example, Robinhood and Interactive Brokers stated that in some cases, investors would only be able to sell their position in certain securities and not open a new position. See, e.g., “Robinhood restricts trading in GameStop, other names involved in frenzy,” CNBC (January 28, 2021), available at: <https://www.cnbc.com/2021/01/28/robinhood-interactive-brokers-restrict-trading-in-gamestop-s.html>.

⁸⁹ See, e.g., “Robinhood, Other Brokerages Restrict Trading on GameStop, AMC,” The Wall Street Journal (January 28, 2021), available at: <https://www.wsj.com/articles/online-brokerages-restrict-trading-on-gamestop-amc-amid-frenetic-trading-11611849934>.

restrictions.⁹⁰ This narrative was the subject of testimony at a Congressional hearing,⁹¹ where witnesses testified that the trading restrictions did not result from such pressure.⁹² Instead, some of the impacted broker-dealers maintained that the trading restrictions were a reaction to margin calls and capital charges imposed by NSCC in response to the extraordinary volatility in GME and other stocks.⁹³

The actions of one broker-dealer help illustrate what happened. The staff observed that, on January 26, 2021, one broker-dealer began increasing both initial and maintenance margin

⁹⁰ See, e.g., “BarStool’s Dave Portnoy, Mets’ Steve Cohen Spar Over Gamestop Drama,” Fox Business (January 28, 2021), available at: <https://www.foxbusiness.com/sports/barstools-dave-portnoy-mets-steve-cohen-gamestop>; “Robinhood CEO refutes ‘conspiracy theory’ that hedge funds prompted GameStop trading halt,” Fox Business (January 30, 2021), available at: <https://www.foxbusiness.com/markets/robinhood-ceo-refutes-conspiracy-theory-hedge-funds-prompted-gamestop-trading-halt>.

⁹¹ See, e.g., “Robinhood CEO Testifies: ‘We Don’t Answer to Hedge Funds,’” ThinkAdvisor (February 18, 2021), available at: <https://www.thinkadvisor.com/2021/02/18/robinhood-ceo-testifies-we-do-not-answer-to-hedge-funds/>.

⁹² See, e.g., Testimony of Vladimir Tenev, Co-Founder and CEO of Robinhood Markets, Inc., (“Robinhood did not impose these trading restrictions at the request of hedge funds or to try and move prices in GameStop one way or the other.”), at Sec. VIII, n.20, Hearing Before the U.S. House Committee on Financial Services (“HCFS”) (February 18, 2021), available at: <https://financialservices.house.gov/uploadedfiles/hhrg-117-ba00-wstate-tenevv-20210218.pdf>; Testimony of Gabriel Plotkin, Founder and Chief Investment Officer, Melvin Capital Management, (“I want to make clear at the outset that Melvin Capital played absolutely no role in those trading platforms’ decisions [to limit trading in GameStop].”), Hearing Before the HCFS (February 18, 2021), available at: <https://financialservices.house.gov/uploadedfiles/hhrg-117-ba00-wstate-plotking-20210218.pdf>; Testimony of Kenneth C. Griffin, Founder and CEO of Citadel and Founder and Principal Shareholder of Citadel Securities, (“I want to be perfectly clear: we had no role in Robinhood’s decision to limit trading in GameStop or any other of the ‘meme’ stocks.”), Before the HCFS (February 18, 2021), available at: <https://financialservices.house.gov/uploadedfiles/hhrg-117-ba00-wstate-griffink-20210218.pdf>.

⁹³ See, e.g., “Robinhood says restrictions on GameStop due to tenfold increase in clearinghouse deposit requirements,” CNBC (January 30, 2021), available at: <https://www.cnbc.com/2021/01/30/robinhood-says-restrictions-on-gamestop-due-to-tenfold-increase-in-deposit-requirements.html>; and Robinhood Markets, Inc., Registration Statement (S-1) (July 1, 2021) (“from January 28 to February 5, 2021, due to increased deposit requirements imposed on [Robinhood’s affiliated clearing broker] by NSCC in response to unprecedented market volatility, particularly in certain securities, we temporarily prevented our customers from purchasing certain specified securities,

requirements in customer margin accounts holding GME. Margin requirements began at 80% and then increased to 100% the following day.⁹⁴ This firm also reduced the trade limit on GME option contracts from 5,000 contracts to 3,000 contracts per customer. The next day, the firm first limited GME option contracts to 300 and later reduced it again to 100 contracts. On January 28, the firm stated that it would restrict all new customer purchases in eight securities—AMC; BlackBerry Ltd.; BBY; EXPR; GME; KOSS; NAKD; and Nokia Corp.—and place them in position closing only (“PCO”) status.⁹⁵ On January 29, the firm stated that it would lift the PCO status and implement a series of limits on the amount of shares its customers could hold in both equity securities and options in a number of securities (“restricted securities”). The firm made adjustments throughout the day. At one point, on January 29, the firm’s list of restricted securities grew to over 50 names. In addition to these position limits, the firm stated that it was no longer permitting fractional share purchases in restricted securities. The firm said it would only allow new whole share positions, subject to the position limits, in the restricted securities. According to the firm, customers owning existing fractional shares in restricted securities were only able to sell or close their positions. The firm said it eased the limits over the next week and removed them entirely on February 5, 2021.

Some broker-dealers temporarily restricted trading for stated reasons they did not explicitly or publicly attribute to NSCC margin. For example, on January 28, one such firm stated that it restricted purchases in GME and AMC for its customers and required customers to post additional margin for one day only.⁹⁶

including GameStop Corp. and AMC Entertainment Holdings, Inc., on our trading platform”).

⁹⁴ “Initial margin” is a percentage of the purchase price of a security that must be covered by cash or collateral when using a margin account. Pursuant to Regulation T, a customer cannot purchase more than 50% of the security using borrowed funds. “Maintenance margin” is the additional funds required if a security’s price goes in the opposite direction of the initial margin transaction. The account must maintain equity of at least 25%, as set forth in FINRA Rule 4210(c). If a security price drops by more than 25%, the customer will receive a margin call from the firm requesting additional money. However, depending on various factors, the broker-dealer may sell out of any position in the customer’s account in order to meet the margin call without requiring the customer’s consent, as it is typically included in the customer agreement at account opening. The amount by which equity in a margin account exceeds the required margin is referred to as “maintenance margin excess.”

⁹⁵ On January 28, 2021, a clearing broker-dealer that services other broker-dealers also instructed its customer broker-dealers (other broker-dealers that have customer accounts) to temporarily restrict new purchases in AMC, GME, and KOSS. This firm represented that it removed the trading restrictions on its customer broker-dealers later that day starting at 2:55 p.m.

⁹⁶ The imposition of additional margin by a broker-dealer to its customers is separate from NSCC margin or capital charges imposed on the NSCC member broker-dealer.

Other broker-dealers restricted trading due to capacity issues. For example, one firm's system created a unique ID for each order, but purportedly reached a limit in the number of unique IDs it was able to create on January 27, 2021.⁹⁷ The following day, January 28, when the firm realized that it would likely run out of unique IDs again, it restricted customers from making new purchases of shares of GME and AMC and from opening option positions in these stocks during the last one and a half hours of the trading day. Customers were still permitted to close their existing long or short GME and AMC positions, and the restriction was lifted before the market opened on January 29.

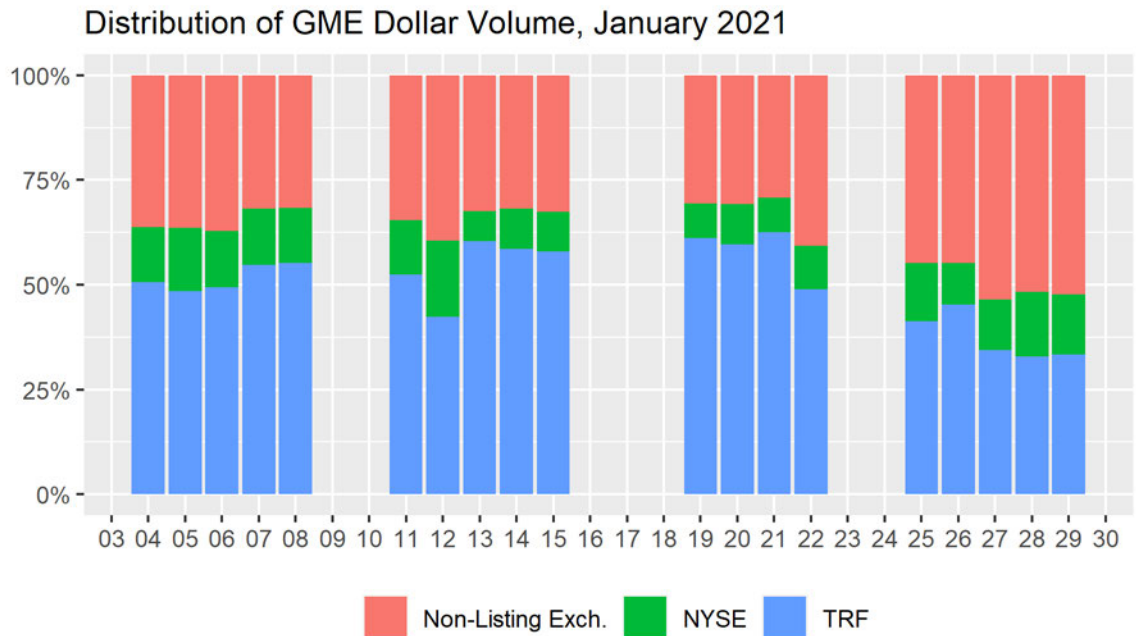
The staff also observed differing practices among broker-dealers when notifying customers about trading restrictions. Some broker-dealers notified customers when they imposed trading restrictions through various methods including emails, pop-up messages when accessing the account or trying to transact in a security that was restricted, posts on dedicated customer service sections of the platform, and social media posts.

3.7 Role of Off-Exchange Market Makers

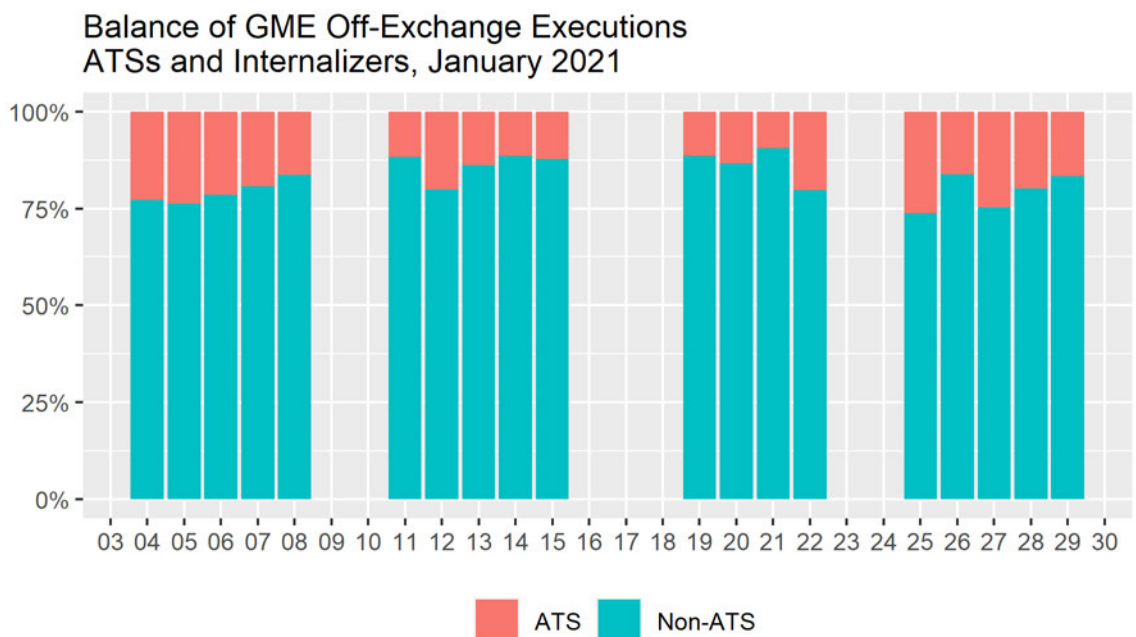
GME trading in January 2021 shifted the prevailing distribution of GME equity executions across venues. Specifically, the proportion of off-exchange activity initially rose as individual investor activity increased, then fell as volatility increased. Approximately half of GME's dollar and share volume reported to the consolidated tape in 2020 was executed on a national securities exchange. On January 21, 2021 (when GME opened at \$39.23 and closed at \$43.03), 62.60% of the day's dollar volume was executed off exchange. But, beginning on January 22 (when GME opened at \$42.59 and closed at \$65.01), the percentage of dollar volume executed off exchange consistently dipped below 50%, reaching a low of 32.83% on January 28 (when GME opened at \$265.00 and closed at \$193.60).

An increasing percentage of volume executed on exchange when volatility spikes may indicate that market participants, including wholesalers, are seeking to avoid internalizing customer orders to reduce potential losses when hedging becomes more difficult.

⁹⁷ The firm's average daily trading volume in 2019 was approximately 300,000 trades per day. In January 2021, the firm handled around 1.6 million trades per day. During the week of January 25, 2021, the firm's daily trading volume hit record highs in three of the five trading days. GME and AMC were the largest drivers of that elevated customer volume in January 2021.

Figure 7⁹⁸

Source: NYSE TAQ

Figure 8

Source: Consolidated Audit Trail

⁹⁸ “TRF” refers to the Trade Reporting Facility for the reporting of transactions effected otherwise than on an exchange.

The vast majority of GME stock trades executed off exchange in January 2021 were internalized (approximately 80%) as opposed to executed on ATs.⁹⁹ The market for internalization of GME was highly concentrated, with 88% of internalized dollar volume in January executed by just three wholesalers.¹⁰⁰ Citadel Securities accounted for nearly 50% of internalized dollar volume during the month, rising to as high as 55% of daily internalized dollar volume twice.¹⁰¹ Virtu Americas accounted for approximately 26% of the internalized volume during January.¹⁰² While the percentage of GME trading internalized declined during the last week in January, the absolute volumes executed by internalizing firms during the days of the most intense trading in this period were, in some cases, an order of magnitude larger than what had previously been typical for these firms. For example, Citadel internalized an average of just under \$37 million of GME per day in December 2020.¹⁰³ On January 27, Citadel internalized nearly \$4.2 billion of GME.¹⁰⁴ Similarly, Virtu internalized an average of \$23.4 million of GME each day in December 2020 and \$2.2 billion of GME on January 26.¹⁰⁵ On January 29, Citadel internalized approximately \$2.2 billion of GME stock, while Virtu internalized approximately \$1.4 billion.¹⁰⁶

3.8 Available Liquidity for GME

To better understand the market for GameStop's equities and options during January 2021, it is important to look beyond the volatility in GME's share price. While volatility, price, and volume increased dramatically in the last two weeks of January, market participants also experienced multiple volatility-induced trading disruptions and deteriorations in some measures of liquidity.

⁹⁹ Source: Consolidated Audit Trail. The attribution of off-exchange volumes in this section, derived from reports of off-exchange executions in the Consolidated Audit Trail, follows the approach in the public FINRA OTC Transparency data. See <https://otctransparency.finra.org/otctransparency/>. Attributions of executed volume reflect the firms with the obligation to report each off-exchange trade to a Trade Reporting Facility (generally the executing broker-dealer), so only show the firm involved on one side of each trade.

¹⁰⁰ Source: Consolidated Audit Trail.

¹⁰¹ Id.

¹⁰² Id. G1 Execution Services (owned by Susquehanna International Group LLP) accounted for approximately 12% of the internalized dollar volume in GME during January 2021.

¹⁰³ Id.

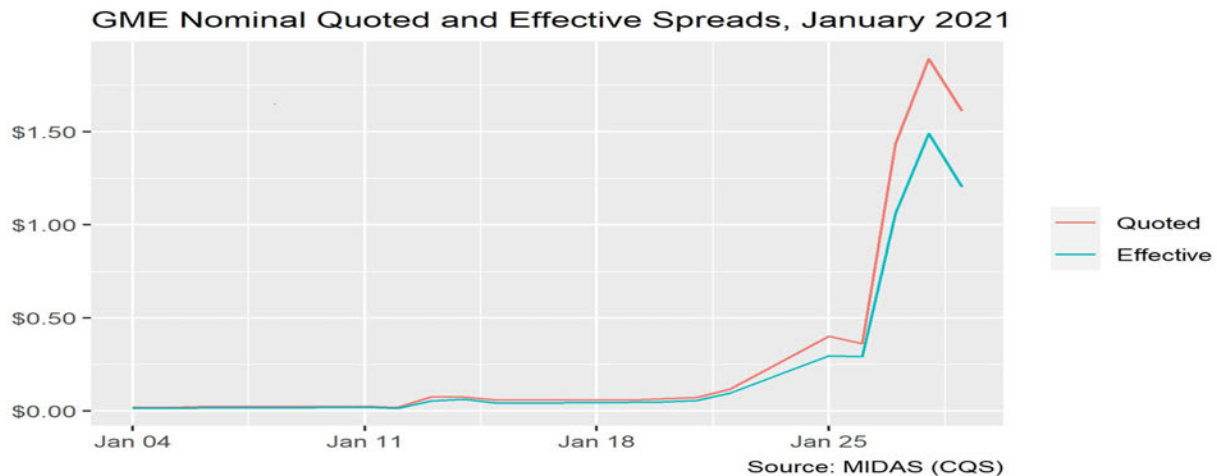
¹⁰⁴ Id.

¹⁰⁵ Id.

¹⁰⁶ Id.

Consistent with increased volatility in GME, various measures of liquidity declined substantially during January 2021.¹⁰⁷ As shown in Figure 9 below, bid-ask spreads widened significantly for GME in January 2021. For example, on January 28, 2021, the daily average relative effective spread for GME stock was 0.54%, three times the average of 0.18% for 2020.¹⁰⁸ Nominal quoted spreads for GME stock were nearly 50 times larger than the 2020 daily average.¹⁰⁹

Figure 9



The size of the best priced quotes in GME stock also decreased as the share price of GME increased. During the first eight months of 2020, the average daily median size at the best bid was 4,720 shares.¹¹⁰ In contrast, on January 29, 2021, when GME opened at \$379.71 (up from the prior day's close at \$193.60), the median size at the best bid was only 19 shares. However, other measures of depth in GME remained relatively robust. Measured in dollar value, the notional value (i.e., share price times number of shares quoted) of GME's inside depth at the best bid and ask prices did not fluctuate as dramatically during January 2021,¹¹¹ signifying that liquidity providers continued to commit capital to quoting GME, albeit with fewer shares as the

¹⁰⁷ As volatility increases, market prices are increasingly likely to experience material fluctuations. As a result, liquidity providers generally would be expected to be more conservative in providing liquidity as they attempt to limit the risk of incurring losses.

¹⁰⁸ Source: Consolidated Quote System (MIDAS).

¹⁰⁹ Id.

¹¹⁰ Source: Exchange proprietary data feeds (MIDAS).

¹¹¹ Id.

share price dramatically increased. Further, as the proportion of volume in GME shifted to exchanges at the end of the month, the dollar value of displayed inside liquidity increased.¹¹²

As extreme intraday volatility in GME occurred, exchanges' Limit-Up, Limit-Down ("LULD") trading pauses were triggered on six trading days in late January. LULD is a trading mechanism that attempts to address extraordinary volatility in stocks. If either the National Best Bid equals the stock's upper bound or the National Best Offer equals the stock's lower bound for fifteen seconds, the stock's trading will be paused for five minutes.¹¹³ Significant price movement in GME during January 2021 triggered 40 LULD pauses, compared with only one in all of 2020.¹¹⁴ On January 28 alone, 19 LULD pauses were triggered in GME.¹¹⁵

Table 1 *Count of LULD Pauses in GME, Late January 2021*¹¹⁶

Date	Down	Up
2021-01-22	1	2
2021-01-25	8	1
2021-01-26	3	2
2021-01-27	3	0
2021-01-28	13	6
2021-01-29	1	0

Source: NYSE TAQ

¹¹² Id. In addition to a larger proportion of the volume in GME trading on exchanges, the increase in the dollar value of displayed inside liquidity may also have resulted from the increase in GME's price.

¹¹³ LULD pauses are triggered when the price of a stock falls outside of a specified price band. Price bands are set at a percentage above and below a "reference price," which is an arithmetic mean of certain reported transactions in the stock over the previous five minutes. The percentage above and below the reference price differs based on the type of stock, the price of the stock, and the time of day.

¹¹⁴ Source: NYSE TAQ.

¹¹⁵ Id. Trading in GME also triggered two short sale circuit breakers on January 15 and January 28. Id. A short sale circuit breaker is triggered when a stock has declined 10% or more relative to the previous day's closing price. When triggered, this mechanism imposes restrictions that last for the remainder of the day and the following day, during which short sale orders generally may not be executed or displayed at a price that is less than or equal to the current National Best Bid. See Rule 201 of Regulation SHO.

¹¹⁶ January 23, 24, 30, and 31 were weekends.

3.9 GME Options Trading

Consistent with the trading activity in GME stock, trading in GME options increased significantly in January 2021. From the beginning of 2020 through September of that year, GME options traded a median of about 16,000 contracts per day, with a maximum of about 172,000 in one day, with a median dollar volume totaling just over \$800,000 per day and a maximum of about \$42 million in one day. In the fourth quarter of 2020, GME options traded a median of about 84,000 contracts per day, with a maximum of about 560,000 in one day, with a median dollar volume totaling approximately \$10.5 million per day and a maximum of about \$120 million in one day. On January 27, 2021, as shown in Figures 10 and 11, below, over 2 million contracts traded, worth over \$8 billion.

Figure 10

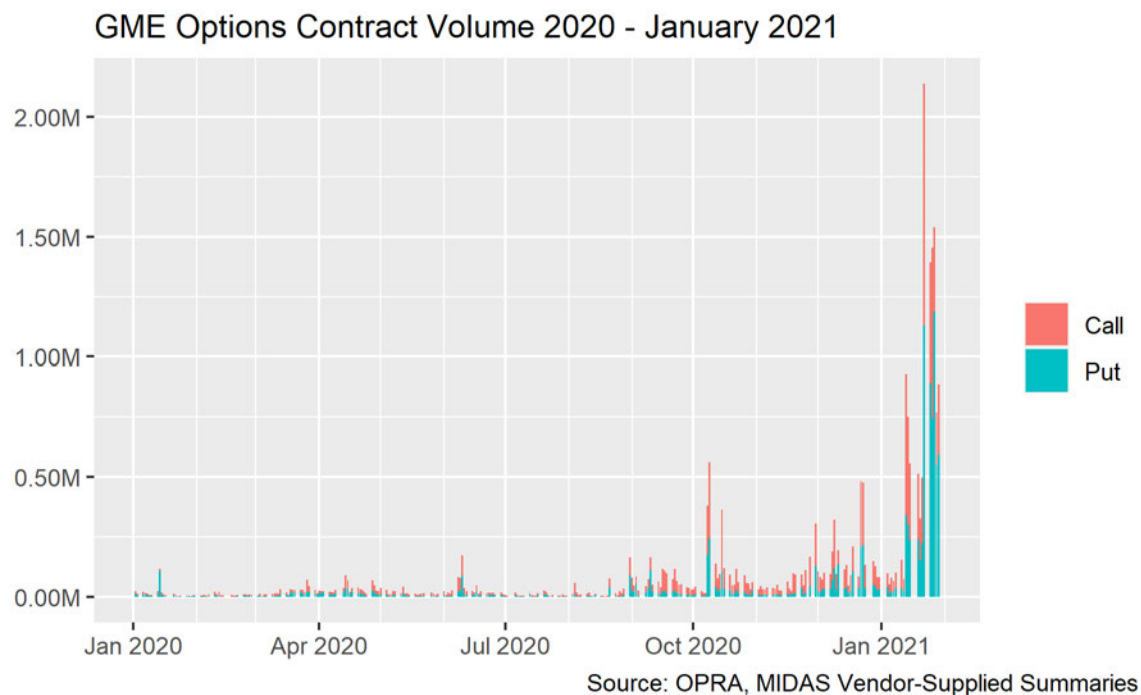
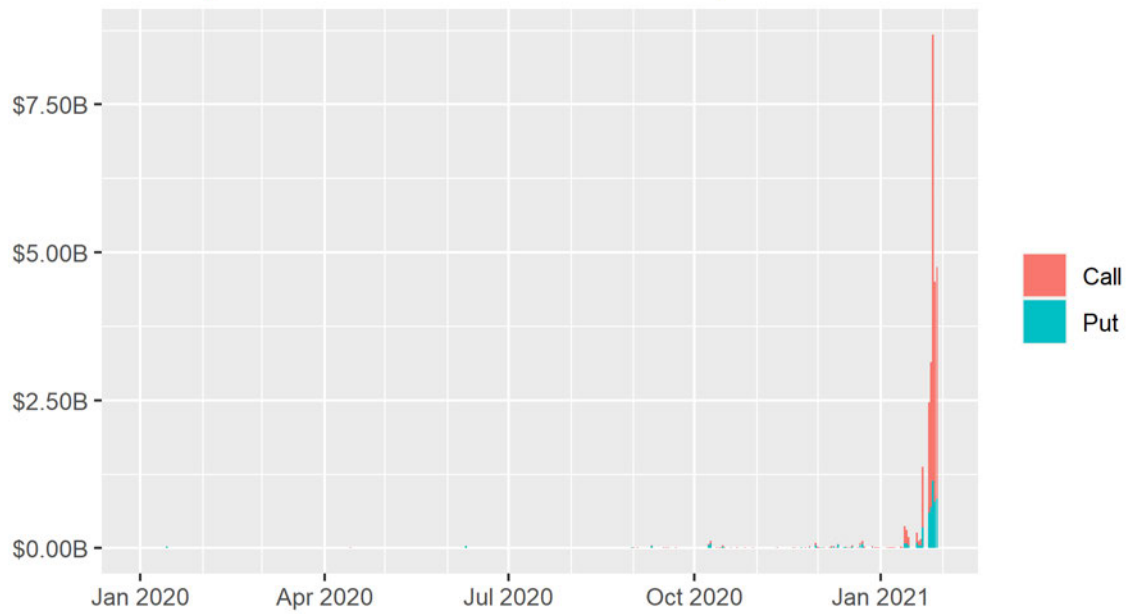
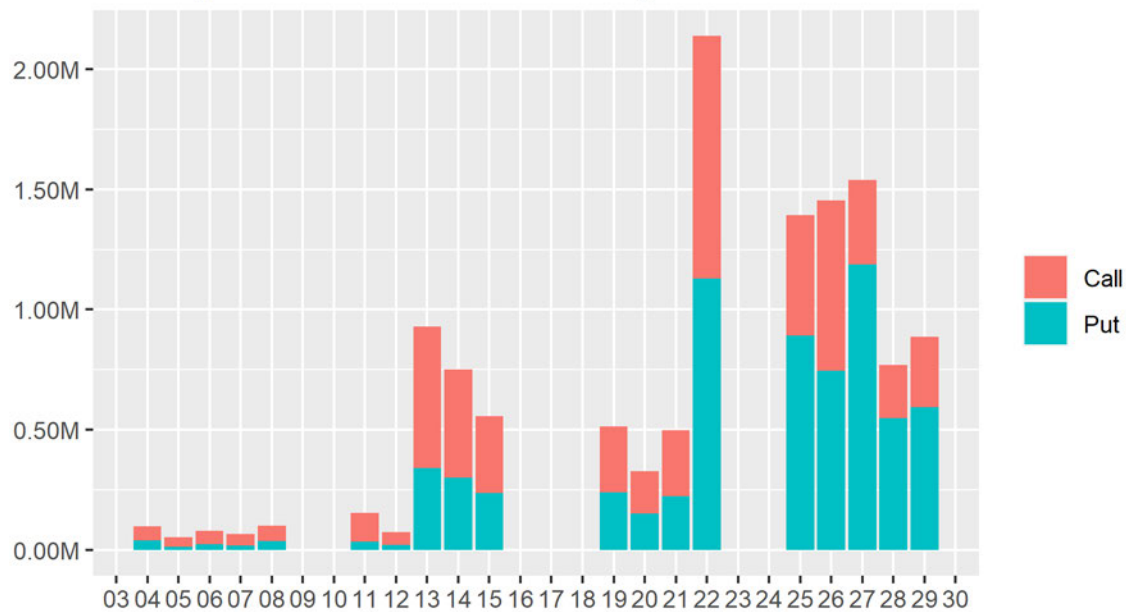


Figure 11**GME Options Dollar Volume 2020 - January 2021**

Source: OPRA, MIDAS Vendor-Supplied Summaries

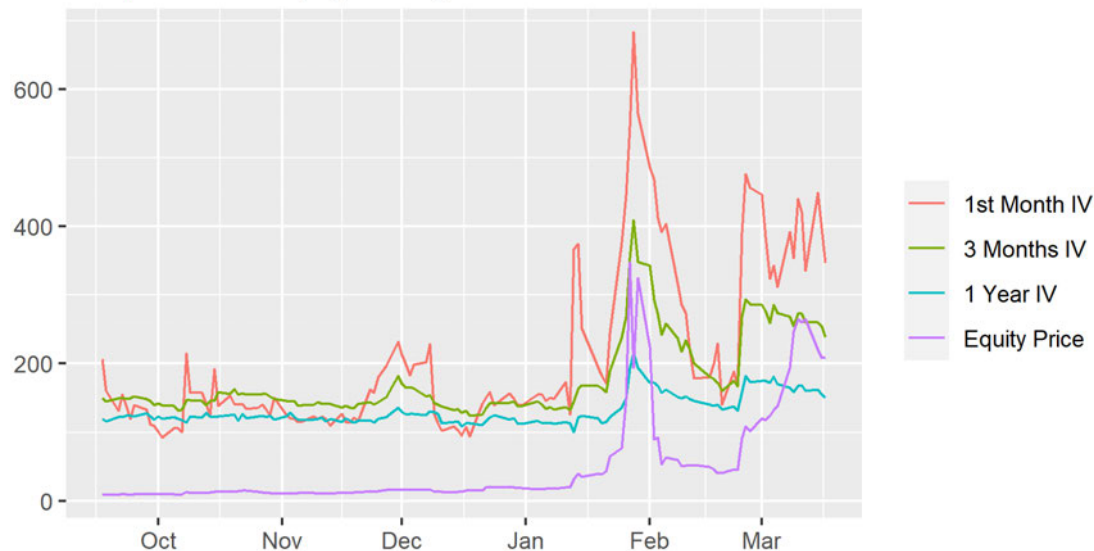
Figure 12**GME Options Contract Volume January 2021**

Source: OPRA, MIDAS Vendor-Supplied Summaries

Based on dollar volumes, the increased trading concentrated heavily in call options, a large percentage of which were short-dated.¹¹⁷ Implied volatility rose dramatically.¹¹⁸ For example, as shown in Figure 13, below, measures of implied volatility for 50 delta¹¹⁹ GME contracts reached levels nine times higher than the typical 2020 range.

Figure 13

Implied Volatility for Select GME 50 Delta Contracts
Compared with Equity Closing Price



Source: Bloomberg

¹¹⁷ Theoretically, a large number of call options written could have contributed to further increases in the price of GME. If market makers purchased GME stock to hedge the risk associated with writing call options on GME, it would put further upward pressure on GME's stock price. However, as discussed above, staff did not find evidence of a gamma squeeze for GME during January 2021 in the available data. See supra Section 3.4.

¹¹⁸ The volatility of the underlying is an input into the price of the option; the greater this volatility the greater the price. Implied volatility is the value of the volatility that makes the market-set option price correct, assuming a lognormal distribution. If the distribution is heavy-tailed rather than lognormal, the implied volatility will lie above true volatility; implied volatility may also lie above measured standard deviation in any given sample. Higher implied volatility can therefore indicate (1) higher actual volatility, (2) heavier tails, or (3) market expectations of volatility that are higher than measured.

¹¹⁹ "Delta" refers to the expected relationship between the option price and the underlying stock price. A delta of 50 (sometimes expressed as .50) signals expectations that the options premium would change by .50 for a \$1 move in the stock price. A 50 delta option is at-the-money.

Individual customer accounts made up a high percentage of options trading in GME during this time. A small number of retail brokers facilitated this activity, with three brokers (Robinhood, TD Ameritrade, and E*Trade Securities) representing over 66% of individual customer accounts trading GME options.¹²⁰ A small number of retail-focused online brokerages had the majority of volume from individual customer accounts, with Robinhood and TD Ameritrade alone accounting for over half of this volume.¹²¹ In mid-January, individual customer accounts reached a peak of 91% of the non-market maker volume in options.¹²² By late January, individual customer accounts were associated with only 56% of non-market-maker volume.¹²³ Between January 22 and January 27, GME traders began to suddenly close their call option positions.¹²⁴

4. Conclusions

The extreme volatility in meme stocks in January 2021 tested the capacity and resiliency of our securities markets in a way that few could have anticipated. At the same time, the trading in meme stocks during this time highlighted an important feature of United States securities markets in the 21st century: broad participation. There are many different types of investors, and they buy and sell stocks for many different reasons. However, when share prices change rapidly and brokerage firms suddenly suspend trading, investors may lose money.

Underneath the memes are actual companies, with employees, customers, and plans to invest in the future. Those who bought GameStop became co-owners of a company through a system of mutual trust and participation that sustains our economy. People may disagree about the prospects of GameStop and the other meme stocks, but those disagreements are what should lead to price discovery rather than disruptions. These events present an opportunity to reflect on the market structure and regulatory framework and identify additional areas for potential study and further consideration in the interests of protecting investors, maintaining fair, orderly, and efficient markets, and facilitating capital formation.

These areas include:

1. *Forces that may cause a brokerage to restrict trading.* A number of clearing brokers experienced intraday margin calls from a clearinghouse. In reaction, some broker-dealers decided to restrict trading in a limited number of individual stocks in a way that some investors may not have anticipated. This episode highlights the integral role clearing

¹²⁰ Source: Consolidated Audit Trail.

¹²¹ Id.

¹²² Id.

¹²³ Id.

¹²⁴ Id.

plays in risk management for equity trading, but raises questions about the possible effects of acute margin calls on more thinly-capitalized broker-dealers and other means of reducing their risks. One method to mitigate the systemic risk posed by such entities to the clearinghouse and other participants is to shorten the settlement cycle.

2. *Digital engagement practices and payment for order flow.* Consideration should be given to whether game-like features and celebratory animations that are likely intended to create positive feedback from trading lead investors to trade more than they would otherwise. In addition, payment for order flow and the incentives it creates may cause broker-dealers to find novel ways to increase customer trading, including through the use of digital engagement practices.
3. *Trading in dark pools and through wholesalers.* Much of the retail order flow in GME was purchased by wholesalers and executed off exchange. Such trading interest is less visible to the wider market—and payments to broker-dealers may raise questions about the execution quality investors receive. Further, though wholesalers increasingly handle individual investor order flow, they face fewer requirements concerning their operational transparency and resiliency as compared to exchanges or ATSs.
4. *Short selling and market dynamics.* While short selling and calls on social media for short squeezes received a great deal of media attention, the interplay between shorting and price dynamics is more complex than these narratives would suggest. Improved reporting of short sales would allow regulators to better track these dynamics.

EXHIBIT 18

Howard Gold's No-Nonsense Investing

Nobel winner Eugene Fama on GameStop, market bubbles and why indexing is king

Last Updated: March 3, 2021 at 2:01 p.m. ET

First Published: March 3, 2021 at 7:58 a.m. ET

By [Howard Gold](#) [Follow](#)

3

Famed finance professor says no investor should 'play that game where you're speculating in individual assets.'

University of Chicago professor Eugene Fama: "The people who are piling into GameStop didn't think they were irrational. Turns out, at least half of them probably lost everything. In that kind of game, when it goes up and comes back down, there are as many losers as there are winners." (Photo by Scott Olson/Getty Images)

Referenced Symbols

GME **2.86%** GOOG **1.05%** AMZN **1.45%**

Starting in the 1960s, Eugene Fama formulated and proved through data and statistical analysis the "efficient market theory."

It became the foundation of finance for the next half-century and provided the rationale for index funds, which now comprise the majority of equity assets.

MarketWatch recently interviewed Fama about some of the wild things going on in today's markets, and, spoiler alert: He still believes his theory.

On the day he won the Nobel Prize in 2013, Fama taught his class at the University of Chicago Booth School of Business, because, he said, "I had never missed a class in all the years I'd been teaching. I wasn't going to start now." At 82, and having been on the faculty since 1963, he still hasn't.

Howard Gold: In a 1976 book you wrote, "The prices of securities observed at any time are based on correct evaluation of all information available at that time. In an efficient market, prices fully reflect available information." I'm assuming that's still the foundation of your thinking.

Eugene Fama: That's the definition of efficient markets. What the research is all about is testing to what extent that's true. For the most part, the model looks very good in the data. For example, if you look at mutual funds, it's very difficult to find any funds that have actually beaten their benchmarks on a statistically reliable basis.

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Gold: Hedge funds supposedly have the best information and the most advanced computers, the most sophisticated algorithms, but—

Fama: They fail with ruthless regularity.


Gold: And they charge good money for it, too.

Fama: Right.

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Gold: But if “the market accurately reflects all information,” why have some active investors beaten the market for long periods of time? Managers like Bill Miller, Bruce Berkowitz, and Peter Lynch did for 10-15 years. Warren Buffett did for 40 years or so. (Nearly all subsequently underperformed.) How do you explain outperformance like that?

Fama: Chance alone can generate big winners when there are a lot of people playing the game. For somebody to throw 15 heads in a row, it’s very low probability to identify, say, “That person will throw 15 heads in a row.” But if you say, “Yeah, I looked at 25,000 investors, and this guy threw 10 heads in a row,” well, that’s not so unlikely anymore, because with that many throws of the die, somebody is going to come up and do it, strictly by chance.

Gold: Is it just pure luck, or do some managers spot a market trend early, ride it for a decade or so, and then after that, they can’t do anything?

Fama: You can’t really tell, because we’re always looking after the fact. Ken French [of Dartmouth College] and I, in our mutual funds study, said, “If I look at the whole cross-section of thousands of mutual funds, is the distribution of outcomes different than what you would expect by chance?”

Gold: What did you find?

Fama: If you look at them after costs, they’re awful. If you look at them before costs, then there’s some evidence that there are winners. But unfortunately, before costs is not what goes to investors; investors get after-cost returns. After the fact, it’s worse than chance, because the fees and expenses are a killer.

Gold: So, you don’t think there’s anyone who can be reliably predicted to beat the market, after costs?

Fama: There might be somebody there, but I don’t think I can identify them in advance. And if I can’t identify them in advance, it’s kind of pointless.

Gold: So, it’s all about predictive value, then, is what you’re saying.

Fama: Right. It’s all about predictive value, not hindsight value.

Gold: Hindsight's 20/20 anyway.

Fama: It's at least 20/20.

Gold: Are there inefficiencies within the market? For example, in the flash crash of 2014, the yield on 10-year Treasuries moved by 1.6% in 12 minutes. And last April, the crude oil price went down to minus \$37 a barrel. How do wild price swings like that fit into your theory?

Fama: Perceptions are important when people act on them. If you were to look at, for example, GameStop, that's a clear case where, for a couple of days, the market was inefficient.

You take a tiny stock and people start piling in. Well, finance is no different from any other branch of economics. It's all supply and demand. If the demand goes crazy, the price can go crazy — temporarily.

Gold: So, does irrationality play a role in the market, not rationally driven behavior, which is what economists have usually assumed? Do you see pockets of irrationality within an efficient market?

Fama: The people who are piling into GameStop didn't think they were irrational. Turns out, at least half of them probably lost everything. In that kind of game, when it goes up and comes back down, there are as many losers as there are winners.

Gold: So, what conclusions should we draw from these episodes?

Fama: No investor should play that game where you're speculating in individual assets. Individual stocks or assets can be out of line for periods of time. You expect them to correct. It's going to generate some big winners, perhaps, but it's also going to generate big losers. And I'm not sure you can say which one you'll be before the game starts. You can protect yourself from things like GameStop by holding a diversified portfolio.

Gold: You and your colleague at Chicago Booth, [Nobel Prize winner] Richard Thaler, have had some spirited discussions about behavioral finance, and again, your main objection to behavioral finance seems to be that it has no predictive value for stock prices.

Fama: What I say is, there is no such thing as behavioral finance. It's just a criticism of efficient markets. What that says to me is I'm the most important person in behavioral finance, because without me, they have nothing to criticize. I have challenged him for the last 25 years or so, "tell me what the behavioral theory of pricing is." He can't do it. There is no such thing.

With respect to markets, what is it? Emotion is important? Big deal. Of course, it is. But what does it imply, empirically? What's the prediction?

Gold: You don't think it describes certain behavior in the market, or certain behavior of individuals acting in the market?

Fama: Maybe individuals, but not prices. You can throw out the exceptions, like GameStop. Some emotions were playing a big role in the crash, in those examples. But those are the exceptions, not the rule.

Gold: Did you also say you don't believe in bubbles?

Fama: I believe in them if you can tell me when they are going to burst. But in my world, the definition of a bubble is something that has a predictable ending. If it's just something you use to describe an up and a down, well, that has no context for me. Those things happen in random series.

Gold: Do you believe in manias or speculation? Would GameStop **GME, 2.86%** be one example?

Fama: For a couple of days, the market was very inefficient.

Gold: OK. And what about the housing bubble?

Fama: That one doesn't work. Because the prices went up and they came down. But now they're up higher than they were at the previous peak, so what's the bubble? Is it the up and the down? Or is the down and the up?

Gold: Maybe it's the up, when people put everything they have into it, and then it goes down, and they sell at the bottom?

Fama: Great, but then how'd it get back up again?

Gold: Other people come in.

A lot of the theories underlying modern finance were based mostly on periods where we had actual positive interest rates. We didn't have a Federal Reserve that was keeping rates at zero and buying trillions of dollars in securities. A lot of the things we're seeing now are things we have never seen before in the market.

Fama: That's almost always true. In the early 1980s, interest rates were up around 20%, and so was inflation. The real rate wasn't much different then than it is now. [The real rate is the interest rate adjusted for inflation.] But now we have exceptionally low inflation, for whatever reason. The real rate is not that far out, relative to historical

numbers. But the real rate bounces around between plus or minus 2%. And it's close to minus 2% now.

Gold: We have seen, over the last ten to 15 years, huge outperformance of growth over value stocks. Could this just be a period of real outperformance for this group, and could we see a reversion to the mean and value re-emerging?

Fama: It's a possibility. But going back, who would predict Google **GOOG, 1.05%** or Amazon **AMZN, 1.45%** being the giants of today? You surely remember the dot-com bubble, or what people call a bubble, but out of that came these companies. Only a few of them really made it big, but they're huge by any historical comparison. If you look at the 50 biggest stocks at any point in time, look 20 years, 30 years later, almost none of those stocks will still be in that group.

Gold: So, is the best strategy for investors to buy low-cost index funds that capture the efficiencies in the market and mute the inefficiencies?

Fama: That's a good way to put it. And then the big problem is deciding how you want to split between short-term bonds — I wouldn't recommend long-term bonds for any individual investors — versus stocks. How much risk do you want to take?

Gold: People always come up to me and ask me for stock tips. And I tell them, "Buy an index fund." They look so disappointed.

Fama: Everybody wants a free lunch, right?

Gold: They think I have some inside knowledge, being a columnist for MarketWatch. Nobody gives me these tips anyway.

Fama: They'd go to jail.

Howard Gold is a MarketWatch columnist. Follow him on Twitter @howardrgold1.

EXHIBIT 19



Equity Research: Healthcare

COMPANY NEWS

August 25, 2021

Cassava Sciences, Inc.

NASDAQ: SAVA

Rating: BUY

Price Target: \$215

Last Price (August 24, 2021): \$117.83

Clinical Data Remain at the Center of Our Focus; 12-Mo Open Label Data in 4Q21. Reiterating BUY/\$215 PT

Summary: Cassava's stock came under pressure after market close yesterday following a negative report from a law firm accusing Cassava's management to be involved in a pattern of preclinical data manipulation. Recent incidence with Athira Pharma (ATHA, Not Rated) is weighing heavy on investors' minds. Cassava's press release this morning addressed most key concerns raised by the report (bit.ly/3Dr83Oq). We do not have the expertise of forensic analysis of western blots or IHC figures nor we have access to the original data. Broadly, we view the report could have few valid points but also possibly overinterpreted with excessive digital analysis of figures published 15+ years ago in few instances. Several of the scientific articles brought into questions were published in reputed journals with rigorous peer review process. We would direct readers to Cassava to get finer details around each published figure. To be noted that the FDA signed off on the Special Protocol Assessment (SPA) for both of the Cassava's pivotal Phase 3 trials in Alzheimer's disease days after the filing of the Citizen's Petition.

The report highlighted one panel out of 65+ panels in the research paper – focusing on 2 out of 300+ gel bands presented in the paper, which as we understand does not affect or alter the conclusion from the figure, is used to build a case for data manipulation. In another instance, figures of actin levels used as loading controls were cropped and magnified to an extent where we can see individual pixels and we believe that could lead to misinterpretation. Also, polyacrylamide gels used for western blot analysis often polymerize in a way that successive lanes could show a strikingly similar protein bands. From what we could discern from the pdf version of the article, the background had different shades and did not look to us that one gel band was replicated. But granted that there was one instance where a figure panel seemed similar to another panel.

Our focus squarely remains on the robust clinical data in Alzheimer's disease presented by Cassava at 9 months – a 7-point ADAS-Cog improvement over historic placebo data, and we expect 12-month data in 4Q21 to maintain high degree of clinical benefits. Cassava will be initiating two Phase 3 trials by YE21 and we expect randomized Cognition Maintenance Study to readout in 1H/mid-22. We have not given any merit to the biomarker data presented so far and we will be looking at the difference in the biomarker levels between 6 and 9 months to arrive to a meaningful conclusion. All biomarkers have failed in conclusively predicting clinical benefits

STOCK DATA

Market Cap (\$BN)	\$4.7
Fully diluted shares (MM)	39.9
52-Week Range	\$2.78 — \$ 146.16
3-Month Avg. Daily Vol. (MM)	4.3
Short Interest (% of Float)	11%

BALANCE SHEET DATA

Cash & Cash Eq. (\$MN)	\$278
Total Assets (\$MN)	\$281
Total Debt (\$MN)	\$0
Cash/Share	\$6.96
Est. 2021 Cash Burn (\$MN)	\$22
Fiscal Year End	December

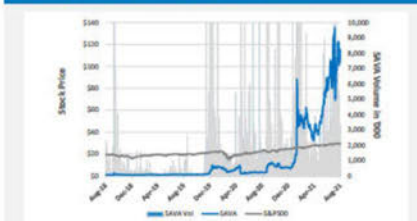
REVENUE (\$MN)

	2020A	2021E	2022E
1Q	0.0	0.0A	—
2Q	0.0	0.0A	—
3Q	0.0	0.0	—
4Q	0.0	0.0	—
FY	0.0	0.0	0.0

EPS (\$)

	2020A	2021E	2022E
1Q	(0.05)	(0.09)A	—
2Q	(0.05)	(0.13)A	—
3Q	(0.06)	(0.14)	—
4Q	(0.09)	(0.17)	—
FY	(0.24)	(0.54)	(0.73)

STOCK CHART - 1 Year History



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in neurodegenerative diseases and broadly speaking, mechanisms of actions of several well adopted drugs are often not well established.

Clinical data is king to us. The Phase 2 open label trial is conducted in 16 centers and management confirmed to us that all statistical analysis is conducted by an outside firm that is unaffiliated with Cassava. We remain positive on the 12-month data in 4Q21 and reiterating BUY and \$215 PT. Key risks to look out for in the coming days would be any communication from the Journals brought into question or the academic centers where the research was done, and any comment from the FDA (docket number FDA-2021-P-0930).

Cash position: Approx. \$278N in cash and equivalents at the end of 2Q21.

Key catalysts for SAVA: (1) 4Q21 (CTAD, November): Cassava's 12-month data from the ongoing open-label study in AD, (2) 2H21: Lilly's zagotenemab (anti-tau ab) Phase 2 results, and (3) 1H/mid-2022: potential data from Phase 2 randomized controlled trial with simufilam.

Valuation & Risks for SAVA: Our DCF/NPV/PE based valuation indicate a 12-month price target of \$215—approx. \$45BN in probability adjusted peak sales in 2035 from simufilam in mild to moderate Alzheimer's disease with a probability of success (POS)/market penetration of 30%/25%. Key risks include clinical trial failure, strict regulatory hurdles leading to peer trial failures and competitive pressure.

Cassava Sciences, Inc. (SAVA)

August 25, 2021

Financial Table — Income Statement, Quarterly

SAVA - QUARTERLY IS (\$MN)	2019A	1Q20A	2Q20A	3Q20A	4Q20A	2020A	1Q21A	2Q21A	3Q21E	4Q21E	2021E	2022E
Simufilam Alzheimer disease	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Product Revenues	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Royalty Revenues	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Collab. & Licensing Revenues	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Revenue	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
COGS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
R&D	1.6	0.5	0.6	0.4	1.5	3.1	2.5	3.9	4.4	5.4	16.2	24.3
SG&A	3.4	0.8	0.8	1.0	1.1	3.7	1.0	1.2	1.5	2.0	5.8	7.0
Gain on sale of property and equipments	0.0	(0.1)	(0.2)	0.0	0.0	(0.3)	0.0	0.0	0.0	0.0	0.0	0.0
Operating Income	(5.0)	(1.2)	(1.2)	(1.4)	(2.6)	(6.4)	(3.5)	(5.1)	(5.9)	(7.4)	(22.0)	(31.3)
Income (expense) & others, net	0.3	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Pretax income	(4.6)	(1.2)	(1.1)	(1.4)	(2.6)	(6.3)	(3.5)	(5.1)	(5.9)	(7.4)	(22.0)	(31.3)
Income Taxes	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Tax Rate</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>
Net Income	(4.6)	(1.2)	(1.1)	(1.4)	(2.6)	(6.3)	(3.5)	(5.1)	(5.9)	(7.4)	(22.0)	(31.3)
Unrealized gain/(loss) on securities available-for-sale	0.0	0.0	(0.0)	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	0.0	(0.0)	(0.0)
Reported EPS	(\$0.27)	(\$0.05)	(\$0.05)	(\$0.06)	(\$0.09)	(\$0.24)	(\$0.09)	(\$0.13)	(\$0.14)	(\$0.17)	(\$0.54)	(\$0.73)
Reported Ordinary Shares Outstanding (MM)	17.4	24.5	24.8	25.0	30.2	26.1	37.7	40.0	42.3	42.6	40.6	42.6

Source: Company Reports & JonesTrading Estimates

Cassava Sciences, Inc. (SAVA)

August 25, 2021

Financial Table — Income Statement, Annual

SAVA - ANNUAL IS (\$MM)	2019A	2020A	2021E	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E	2034E	2035E	2036E	2037E	2038E	2039E	2040E
<i>Simufilam Alzheimer disease</i>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 31	\$ 1,055	\$ 4,001	\$ 8,880	\$ 14,756	\$ 20,735	\$ 26,818	\$ 33,006	\$ 39,301	\$ 44,661	\$ 48,070	\$ 49,484	\$ 49,920	\$ 50,360	\$ 50,804
Total Product Revenues	-	-	-	-	-	-	-	31	1,055	4,001	8,880	14,756	20,735	26,818	33,006	39,301	44,661	48,070	49,484	49,920	50,360	50,804
Royalty Revenues	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Collab. & Licensing Revenues	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Revenue	-	-	-	-	-	-	-	31	1,055	4,001	8,880	14,756	20,735	26,818	33,006	39,301	44,661	48,070	49,484	49,920	50,360	50,804
COGS	0	0	0	0	0	0	0	5	158	600	1332	2213	3110	4023	4951	5895	6699	7210	7423	7488	7554	7621
RED	2	3	16	24	29	30	31	31	32	33	34	35	36	36	37	38	39	40	41	42	43	44
SG&A	3	4	6	7	7	8	15	23	24	25	27	28	29	31	32	34	36	38	39	41	44	46
Operating Income	(5)	(6)	(22)	(31)	(37)	(38)	(46)	(29)	840	3343	7488	12480	17560	22728	27985	33334	37887	40781	41979	42345	42715	43088
Interest & Other Income	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pretax Income	(5)	(6)	(22)	(31)	(37)	(38)	(46)	(28)	840	3343	7488	12480	17560	22728	27985	33334	37887	40781	41979	42345	42715	43088
Income Taxes	0	0	0	0	0	0	0	0	168	669	1498	2496	3512	4546	5597	6667	7577	8156	8396	8469	8543	8618
Tax Rate	0%	0%	0%	0%	0%	0%	0%	0%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Net Income	\$ (5)	\$ (6)	\$ (22)	\$ (31)	\$ (37)	\$ (38)	\$ (46)	\$ (28)	\$ 672	\$ 2,674	\$ 5,990	\$ 9,984	\$ 14,048	\$ 18,182	\$ 22,388	\$ 26,667	\$ 30,310	\$ 32,624	\$ 33,583	\$ 33,876	\$ 34,172	\$ 34,470
Reported EPS	\$ (0.27)	\$ (0.24)	\$ (0.54)	\$ (0.73)	\$ (0.86)	\$ (0.88)	\$ (1.08)	\$ (0.67)	\$ 15.77	\$ 62.76	\$ 140.60	\$ 234.34	\$ 329.72	\$ 426.75	\$ 525.47	\$ 625.90	\$ 711.40	\$ 765.73	\$ 788.23	\$ 795.11	\$ 802.05	\$ 809.05
Reported Ordinary Shares Outstanding (MM)	17	26	41	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43

Source: Company Reports & JonesTrading Estimates

IMPORTANT DISCLOSURES APPENDIX**Analyst Certification**

I, Soumit Roy, the analyst principally responsible for the preparation of this research report hereby certify that the views expressed in this research report accurately reflect my personal views about the subject security(ies) or issuer(s) and that my compensation was not, is not, or will not be directly or indirectly related to the specific recommendations or views contained in this research report.

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Company Name	Disclosure(s)
Cassava Sciences, Inc.	4

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Buy: estimated that the subject company's total return will be positive 15% or more in the next 12 months*

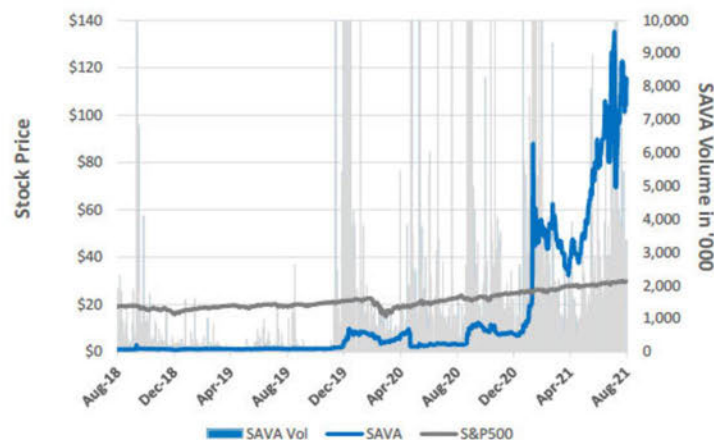
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The following chart reflects the range of current research report ratings for all companies followed by the analysts of the Firm. The chart also reflects the research report ratings relating to those companies for which the Firm has performed investment banking services.

Rating	JonesTrading Company Coverage		Investment Banking Services Within Past 12 Months	
	Count	Percent	Count	Percent
BUY	56	86%	25	45%
HOLD	8	12%	2	25%
SELL	1	2%	1	100%



Date:	Action:	Target Price:
March 17, 2021	Initiation of Coverage with a BUY rating	\$110.00
July 29, 2021	Raising PT, Maintaining BUY rating	\$215.00

Additional Significant Risk Factors and Investment Considerations

The securities or trading strategies discussed in this report may not be suitable for some investors. Investors must independently evaluate each issuer, security, or instrument discussed in this report and consult independent advisors where necessary.

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2. Market Risk: Securities may decline in value due to factors affecting securities markets generally or particular industries. The value of a security may be worth less than the original investment.
3. Concentration risk: Investing a substantial portion of assets in securities within a single industry or sector of the economy may be subject to greater price volatility or adversely affected by the performance of securities in that particular sector or industry.
4. Leverage Risk: Fluctuations in interest rates on borrowings or the dividend rates on preferred shares as a result of changes in short-term interest rates may reduce the return to common shareholders or result in fluctuations in the dividends paid on the common shares. There is no assurance that a leverage strategy will be successful.
5. Foreign Investment Risk: Investment in foreign securities (both governmental and corporate) may involve a high degree of risk. In regards to debt securities, such risks may impair the timely payment of principal and/or interest.

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EXHIBIT 20



Equity Research: Healthcare

COMPANY NEWS

August 27, 2021

Cassava Sciences, Inc.

NASDAQ: SAVA

Rating: BUY

Price Target: \$215

Last Price (August 26, 2021): \$70.85

Clarification on Biomarker Data from Third party. Reiterating BUY/\$215 PT

Summary: Cassava and Quanterix (QTRX, Not Rated) clarified the role of Quanterix in the Phase 2b clinical study conducted by Cassava (Cassava press release: [link](#); Quanterix press release: [link](#)). In this study, Quanterix measured levels of p-tau in plasma samples collected from study subjects treated either with simufilam or placebo, and were blinded to the type of sample. The raw data was then analyzed by Cassava and presented at the Alzheimer's Association International Conference (AAIC) in July 2021.

Cassava's stock has been under pressure for the last few days following a negative report from a law firm accusing Cassava's management to be involved in a pattern of preclinical data manipulation. Cassava's press release on August 25th addressed most key concerns raised by the report (bit.ly/3Dr83Og). The Phase 2 open label trial is conducted in 16 centers and management confirmed to us that all statistical analysis is conducted by an outside firm that is unaffiliated with Cassava. Several of the scientific articles brought into questions were published in reputed journals with rigorous peer review process. To be noted that the FDA signed off on the Special Protocol Assessment (SPA) for both of the Cassava's pivotal Phase 3 trials in Alzheimer's disease days after the filing of the Citizen's Petition.

We believe we will see a turnaround in the stock in the near term as the broader biotech starts to recover in September and SAVA presenting nice entry point leading into November data. Our focus squarely remains on the robust clinical data in Alzheimer's disease presented by Cassava at 9 months – a 7-point ADAS-Cog improvement over historic placebo data, and we expect 12-month data in 4Q21 to maintain high degree of clinical benefits. Cassava will be initiating two Phase 3 trials by YE21 and we expect randomized Cognition Maintenance Study to readout in 1H/mid-22. We have not given any merit to the biomarker data presented so far and we will be looking at the difference in the biomarker levels between 6 and 9 months to arrive to a meaningful conclusion. All biomarkers have failed in conclusively predicting clinical benefits in neurodegenerative diseases and broadly speaking, mechanisms of actions of several well adopted drugs are often not well established.

We remain positive on the 12-month data in 4Q21 and reiterating BUY and \$215 PT. Key risks to look out for in the coming days would be any communication from the Journals brought into question or the academic centers where the research was done, and any comment from the FDA (docket number FDA-2021-P-0930).

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STOCK DATA

Market Cap (\$BN)	\$2.8
Fully diluted shares (MM)	39.9
52-Week Range	\$2.78 — \$ 146.16
3-Month Avg. Daily Vol. (MM)	5.1
Short Interest (% of Float)	14%

BALANCE SHEET DATA

Cash & Cash Eq. (\$MN)	\$278
Total Assets (\$MN)	\$281
Total Debt (\$MN)	\$0
Cash/Share	\$6.96
Est. 2021 Cash Burn (\$MN)	\$22
Fiscal Year End	December

REVENUE (\$MN)

	2020A	2021E	2022E
1Q	0.0	0.0A	—
2Q	0.0	0.0A	—
3Q	0.0	0.0	—
4Q	0.0	0.0	—
FY	0.0	0.0	0.0

EPS (\$)

	2020A	2021E	2022E
1Q	(0.05)	(0.09)A	—
2Q	(0.05)	(0.13)A	—
3Q	(0.06)	(0.14)	—
4Q	(0.09)	(0.17)	—
FY	(0.24)	(0.54)	(0.73)

STOCK CHART - 1 Year History



Soumit Roy, PhD

Research Analyst

646-454-2714

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Cash position: Approx. \$278N in cash and equivalents at the end of 2Q21.

Key catalysts for SAVA: (1) 4Q21 (CTAD, November): Cassava's 12-month data from the ongoing open-label study in AD, (2) 2H21: Lilly's zagotenemab (anti-tau ab) Phase 2 results, and (3) 1H/mid-2022: potential data from Phase 2 randomized controlled trial with simufilam.

Valuation & Risks for SAVA: Our DCF/NPV/PE based valuation indicate a 12-month price target of \$215—approx. \$45BN in probability adjusted peak sales in 2035 from simufilam in mild to moderate Alzheimer's disease with a probability of success (POS)/market penetration of 30%/25%. Key risks include clinical trial failure, strict regulatory hurdles leading to peer trial failures and competitive pressure.

Cassava Sciences, Inc. (SAVA)

August 27, 2021

Financial Table — Income Statement, Quarterly

SAVA - QUARTERLY IS (\$MN)	2019A	1Q20A	2Q20A	3Q20A	4Q20A	2020A	1Q21A	2Q21A	3Q21E	4Q21E	2021E	2022E
Simufilam Alzheimer disease	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Product Revenues	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Royalty Revenues	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Collab. & Licensing Revenues	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Revenue	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
COGS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
R&D	1.6	0.5	0.6	0.4	1.5	3.1	2.5	3.9	4.4	5.4	16.2	24.3
SG&A	3.4	0.8	0.8	1.0	1.1	3.7	1.0	1.2	1.5	2.0	5.8	7.0
Gain on sale of property and equipments	0.0	(0.1)	(0.2)	0.0	0.0	(0.3)	0.0	0.0	0.0	0.0	0.0	0.0
Operating Income	(5.0)	(1.2)	(1.2)	(1.4)	(2.6)	(6.4)	(3.5)	(5.1)	(5.9)	(7.4)	(22.0)	(31.3)
Income (expense) & others, net	0.3	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Pretax income	(4.6)	(1.2)	(1.1)	(1.4)	(2.6)	(6.3)	(3.5)	(5.1)	(5.9)	(7.4)	(22.0)	(31.3)
Income Taxes	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Tax Rate</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>	<i>0%</i>
Net Income	(4.6)	(1.2)	(1.1)	(1.4)	(2.6)	(6.3)	(3.5)	(5.1)	(5.9)	(7.4)	(22.0)	(31.3)
Unrealized gain/(loss) on securities available-for-sale	0.0	0.0	(0.0)	(0.0)	0.0	(0.0)	0.0	(0.0)	0.0	0.0	(0.0)	(0.0)
Reported EPS	(\$0.27)	(\$0.05)	(\$0.05)	(\$0.06)	(\$0.09)	(\$0.24)	(\$0.09)	(\$0.13)	(\$0.14)	(\$0.17)	(\$0.54)	(\$0.73)
Reported Ordinary Shares Outstanding (MM)	17.4	24.5	24.8	25.0	30.2	26.1	37.7	40.0	42.3	42.6	40.6	42.6

Source: Company Reports & JonesTrading Estimates

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August 27, 2021

Financial Table — Income Statement, Annual

SAVA - ANNUAL IS (\$MM)	2019A	2020A	2021E	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E	2034E	2035E	2036E	2037E	2038E	2039E	2040E
<i>Simufilam Alzheimer disease</i>	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 31	\$ 1,055	\$ 4,001	\$ 8,880	\$ 14,756	\$ 20,735	\$ 26,818	\$ 33,006	\$ 39,301	\$ 44,661	\$ 48,070	\$ 49,484	\$ 49,920	\$ 50,360	\$ 50,804
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Royalty Revenues	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Collab. & Licensing Revenues	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Revenue	-	-	-	-	-	-	-	31	1,055	4,001	8,880	14,756	20,735	26,818	33,006	39,301	44,661	48,070	49,484	49,920	50,360	50,804
COGS	0	0	0	0	0	0	0	5	158	600	1332	2213	3110	4023	4951	5895	6699	7210	7423	7488	7554	7621
RED	2	3	16	24	29	30	31	31	32	33	34	35	36	36	37	38	39	40	41	42	43	44
SG&A	3	4	6	7	7	8	15	23	24	25	27	28	29	31	32	34	36	38	39	41	44	46
Operating Income	(5)	(6)	(22)	(31)	(37)	(38)	(46)	(29)	840	3343	7488	12480	17560	22728	27985	33334	37887	40781	41979	42345	42715	43088
Interest & Other Income	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pretax Income	(5)	(6)	(22)	(31)	(37)	(38)	(46)	(28)	840	3343	7488	12480	17560	22728	27985	33334	37887	40781	41979	42345	42715	43088
Income Taxes	0	0	0	0	0	0	0	0	168	669	1498	2496	3512	4546	5597	6667	7577	8156	8396	8469	8543	8618
Tax Rate	0%	0%	0%	0%	0%	0%	0%	0%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Net Income	\$ (5)	\$ (6)	\$ (22)	\$ (31)	\$ (37)	\$ (38)	\$ (46)	\$ (28)	\$ 672	\$ 2,674	\$ 5,990	\$ 9,984	\$ 14,048	\$ 18,182	\$ 22,388	\$ 26,667	\$ 30,310	\$ 32,624	\$ 33,583	\$ 33,876	\$ 34,172	\$ 34,470
Reported EPS	\$ (0.27)	\$ (0.24)	\$ (0.54)	\$ (0.73)	\$ (0.86)	\$ (0.88)	\$ (1.08)	\$ (0.67)	\$ 15.77	\$ 62.76	\$ 140.60	\$ 234.34	\$ 329.72	\$ 426.75	\$ 525.47	\$ 625.90	\$ 711.40	\$ 765.73	\$ 788.23	\$ 795.11	\$ 802.05	\$ 809.05
Reported Ordinary Shares Outstanding (MM)	17	26	41	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43

Source: Company Reports & JonesTrading Estimates

IMPORTANT DISCLOSURES APPENDIX**Analyst Certification**

I, Soumit Roy, the analyst principally responsible for the preparation of this research report hereby certify that the views expressed in this research report accurately reflect my personal views about the subject security(ies) or issuer(s) and that my compensation was not, is not, or will not be directly or indirectly related to the specific recommendations or views contained in this research report.

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Company Name	Disclosure(s)
Cassava Sciences, Inc.	4

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The appropriate rating is based off the estimated value of the stock over a forward 12-month period, including both share appreciation and anticipated dividends.

The price target represents the analyst's best estimate of the market price in a 12-month period. JonesTrading cautions that price targets are based on assumptions related to the company, industry and investor climate. As such, price targets remain highly subjective.

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Hold:	estimated that the subject company's total return will be in a range not more than 15% positive or negative in the next 12 months; JonesTrading does not provide 12-month price targets on stocks with a Hold rating*
Sell:	estimated that the subject company's total return will be negative 15% or more in the next 12 months*
* Ratings may be maintained as long as it is deemed appropriate by JonesTrading notwithstanding price fluctuations that cause the total return percentage to fall outside the specific rating definition.	

The following chart reflects the range of current research report ratings for all companies followed by the analysts of the Firm. The chart also reflects the research report ratings relating to those companies for which the Firm has performed investment banking services.



Date:	Action:	Target Price:
March 17, 2021	Initiation of Coverage with a BUY rating	\$110.00
July 29, 2021	Raising PT, Maintaining BUY rating	\$215.00

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EXHIBIT 21



First Take

Cassava Sciences, Inc. (SAVA)

November 4, 2021

Price: \$56.66; Market Cap (M): \$2,266; 11/3/2021 Close

Rating: Buy; Price Target: \$124.00

Vernon Bernardino - (646-975-6954) / vbernardino@hcwresearch.com

When Doubt Has Come, Stand by Me(chanism of Action) With Simufilam; Reiterate 2021 Top Pick Buy

Journal of Neuroscience review shows no evidence of data manipulation. Today, Cassava Sciences announced that the *Journal of Neuroscience* verified that there was no evidence of Western blots data manipulation in an article Cassava published in July 2012 describing simufilam as a proposed treatment of Alzheimer's disease (AD). Recall that simufilam, a small molecule that restores the normal shape and function of altered filamin A (FLNA), a scaffolding protein, in the brain, is being studied in a Phase 3 study in participants with mild-to-moderate AD for 52 weeks. Notably, we previously reported concerns over interpretation of the open-label study's results with critics pointing to a placebo as a significant factor in the cognitive improvement observed. Thus, results from the ongoing open-label study with simufilam appear positive so far. We believe the -3.0-point ADAS-Cog improvement with simufilam observed at nine months goes beyond any improvement that may be observed after six months of treatment with placebo or donepezil, the most commonly prescribed drug for AD. We see this news as promising and for simufilam in AD. Therefore, we reiterate our Buy rating and PT of \$124, and believe Cassava shares are an attractive buying opportunity ahead of initiation of the second of two planned Phase 3 studies with simufilam in 4Q21.

Valuation and Risks. Our \$124 PT is derived by using a weighted-average cost of capital of 13% versus for Cassava shares to discount free cash flows from our projection of annual sales of simufilam in Alzheimer's disease, and dividing them by our projected number of shares for each year to account for the effects of share dilution. We then factored in a 2% terminal growth rate, and a 65% clinical program probability of success. Investment thesis risks include failure of clinical trials to prove efficacy, regulatory requirements for additional clinical studies, assembling a commercialization team, failure to show competitive differentiation, intellectual property expiry or invalidation, and potential need to raise additional funds under poor market conditions. We look for the company to sign a lucrative, milestone payment-rich, non-dilutive simufilam development and commercialization agreement in late 2021 or early 2022.

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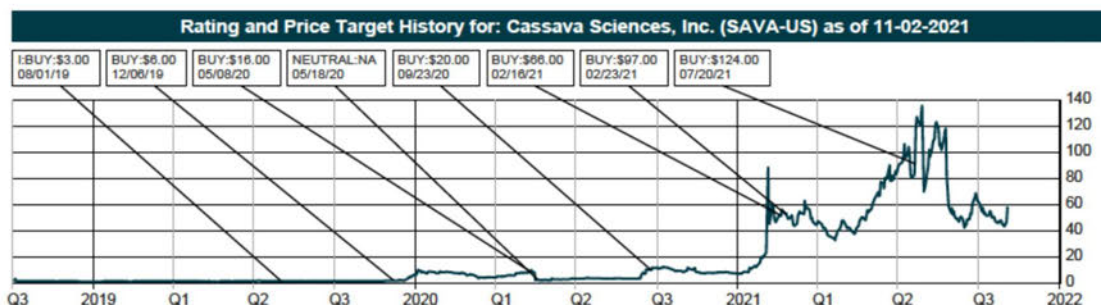
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RETURN ASSESSMENT

Market Outperform (Buy): The common stock of the company is expected to outperform a passive index comprised of all the common stock of companies within the same sector.

Market Perform (Neutral): The common stock of the company is expected to mimic the performance of a passive index comprised of all the common stock of companies within the same sector.

Market Underperform (Sell): The common stock of the company is expected to underperform a passive index comprised of all the common stock of companies within the same sector.



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Distribution of Ratings Table as of November 2, 2021				
Ratings	Count	Percent	IB Service/Past 12 Months	
			Count	Percent
Buy	545	90.23%	198	36.33%
Neutral	55	9.11%	14	25.45%
Sell	1	0.17%	0	0.00%
Under Review	3	0.50%	1	33.33%

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EXHIBIT 22

Biotechnology

SAVA - NASDAQ

November 11, 2021

Closing Price 11/10/21 **\$69.40**
 Rating: Buy
 12-Month Target Price: \$190.00
 52-Week Range: \$6.70 - \$146.16
 Market Cap (M): 2,777.0
 Shares O/S (M): 40.0
 Float: 93.2%
 Avg. Daily Volume (000): 8,406.0
 Debt (M): \$0.0
 Dividend: \$0.00
 Dividend Yield: 0.0%
 Risk Profile: Speculative
 Fiscal Year End: December

Total Expenses ('000)

	2020A	2021E	2022E
1Q	1,222	3,533A	8,889
2Q	1,163	5,138A	9,275
3Q	1,437	9,753A	10,048
4Q	1,581	9,778	10,434
FY	5,403	28,202	38,646
Prior	—	18,996	29,956



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Cassava Sciences, Inc.

Buy

Connecting the Dots on One Roller Coaster of a Year for SAVA Shares

Summary

- Cassava reported 3Q21 results yesterday morning (11/10) with a net loss of (\$9.6M) and ended the period with \$241.5M in cash on the balance sheet. Based on 3Q results and our expectations, we raise our total expenses estimate to \$28.2M, from \$19.0M in 2021, and to \$38.6M, from \$30.0M in 2022.
- SAVA shares have been volatile in 2021, to say the least, as one of the most talked about names in biotech stemming from its Alzheimer's disease (AD) drug candidate Simufilam. Understanding the activity around the events leading to this 'roller coaster' ride of a biotech story in 2021 is important as it took a more positive turn once again, in our view, with two events: 1) starting the P3 study, and 2) the Journal of Neuroscience's review of the data in question presented in the Citizen Petition (CP) filed with FDA in August.
- The CP injected additional risk into the Cassava story, though we are not here to debate the merits of the CP or the source(s) from which it came. Our fundamental thesis and positive view around Simufilam and the potential in AD are based on peer-reviewed scientific literature, clinical and pre-clinical data, regulatory review, and regulatory filings. These views remain unchanged, and we look forward to updates in the P3 trial and the full data set from the P2b extension study. Let's now connect the dots on SAVA shares in 2021.

Details

Cassava in 2021 – what a ride. SAVA shares reached an all-time high this summer and then pulled back significantly coming out of the AAIC (Alzheimer's Association International Conference) meeting in July, a downward move in the stock that accelerated with the 8/24 filing of a Citizen's Petition (CP) questioning the credibility of the Simufilam data. However, recent events, including both initiation of the P3 study and the Journal of Neuroscience validating the data in question in the CP have driven a rise in SAVA shares. Understanding the series of events and the timeline to today is important...let's look at the SAVA stock price chart for 2021 and try to make sense of it.

January to mid-February. SAVA shares early in the year were relatively flat as the company was still awaiting its 6-month cognition data from the P2b extension study. The rising value in SAVA shares started in mid-January ahead of the data and then accelerated, or rather spiked, on 2/2-2/3 to ~\$88 per share (even higher to over \$120 per share in after hours trading that night) based on positive 6-month cognition data in the open-label P2b extension study. The data demonstrated a 1.6pt improvement in ADAS-Cog11 score in 50 patients. Sure, it was open-label and a small n-value, but when compared to what could be expected from standard of care (SOC) acetylcholinesterase inhibitors, which show stabilization-to-some improvement over this time period, the data for Simufilam were quite compelling. The pushback was that there could be a significant placebo effect combined with small N values driving the result. Investors also seemed to push back on use of ADAS-Cog11 vs. ADAS-Cog13, though given the stage of AD for patients in the study, the ADAS-Cog11 was more appropriate. However, it's also been shown that over a period that long, it's likely that any placebo effect may have passed.

In addition, the more attractive safety profile of Simufilam combined with the cognition data, suggested this drug could potentially emerge as a new SOC if it were to be successful in larger, later stage trials vs. placebo. Shares pulled back from the ~\$88 high to ~\$44 per share, likely from profit taking on such a rapid rise in value. However, SAVA shares got another small run-up that peaked at ~\$57, which coincided with what was a peaking overall market, including biotech stocks in mid-February driven by, in our opinion, investor enthusiasm...(continued on page 2)

on what the space accomplished in the fight against COVID, and the prospect of 'return to normal' vaccine approvals and distribution, the monoclonal antibody therapy approvals, the success of remdesivir and oral antivirals having early success. Cassava at the time, more specifically on 2/10/21, on the back of the 6-month cognition data, opted to strengthen its balance sheet with a \$200M equity financing at \$49 per share to fund further Simufilam development into, and potentially through, P3 trials.

Mid-February to early-May. With the capital raise in hand and a more broad pullback in the biotech space since the February highs, SAVA shares retreated some and traded within a ~\$40-\$60 range, relatively in-line with biotech indexes or ETFs like IBB until about mid-May where biotech in general, again, seemed to reach another peak, though not as high as mid-February, and again there was some sell-off. This is where things really start to get interesting with the Biogen (BIIB - NR) and aducanumab (now "Aduhelm") saga once again.

Mid-May to Mid-June. By mid-May, the PDUFA for Biogen's amyloid plaque-clearing antibody therapy, which had already 'whipsawed' Alzheimer's valuations, especially for BIIB shares since March 2019 (phase 3 readouts disappoint, then don't, then do, the story is over, then it's not, and then Biogen is filing a BLA...you all know the story) was now approaching on 6/7/21. As such, the AD space was again center stage and excitement started to build, further exacerbated by media coverage of a potential new medicine for AD coming soon. This indirectly lifted SAVA shares ahead of the aducanumab PDUFA. On 6/7, aducanumab was approved (brand name "Aduhelm"), Biogen spikes through \$400, and other names in the space, including Cassava, INmune Bio (INMB - Buy), and Annovis Bio (ANVS - Buy), and are indirect beneficiaries and see their valuations continuing to rise in response. This happened before the AAIC meeting (Alzheimer's Association International Conference) taking place 7/26-7/29.

Mid-June to late-July. Aduhelm is approved, and the focus turns to the AAIC meeting, which was expected to have a number of important presentations, most notably Cassava's simufilam 9-month cognition data and possibly biomarker data from 6-month measures in the same study. Cassava did not specifically say these data readouts would be at AAIC, but the back-of-the-napkin calculation on a timeline since the 6-month data was announced in early February, pointed to many that AAIC would be the highest probability for the next data set for Simufilam. As such, considering the reaction to the 6-month data, the Aduhelm approval, and so much focus from the investment community and media on Alzheimer's (note, June is also Alzheimer & Brain Awareness month), SAVA shares continued to rise in value to ~\$105 per share, right up until 7/15/21. Then what happened? SAVA shares received a downgrade from an analyst based on their rationale that the potential success for Simufilam was already priced into SAVA shares and that the 9-month data at AAIC would only be an incremental catalyst. Following the downgrade, SAVA shares slid to ~\$80 per share, bottomed there, then started a run-up into AAIC, hitting over \$135 per share. Now it's time for the AAIC meeting, though we would preface this, as we had published on 8/3/21, the data was a positive for Simufilam.

Alzheimer's Association International Conference (AAIC), 7/26-7/29. SAVA shares peak by closing on 7/28 at ~\$135 per share. The anticipation has built up for the data release on Simufilam 9-month cognition effects before the open on 7/29. The data is coming soon that morning, coincidentally just after another much-anticipated data set from Annovis Bio, which started a sell-off in ANVS shares, and that started to impact SAVA shares. Then, the Simufilam hits the wire soon after, still pre-market and the sell-off accelerates. The Simufilam data was actually really positive, with the 6-month ADAS-Cog11 score that showed 1.6 months of improvement back in the February readout, increasing to 3pts improvement at 9-months. Of course this is the same 50 patients in the open-label P2b extension study, which in our view, was further demonstration of the drug's impact on cognition and durability in response that seems to be surpassing what SOC acetylcholinesterase inhibitors can do for patients. The biomarker data was also positive and supportive of the longer-term impacts that Simufilam was inducing around cognition. Still, open-label, small n-value, no control...we understand. Then why the sell-off? The answer is complex and likely multi-factorial, which we discussed in our note on 8/3/21; profit taking, market dynamics, and a sell-the-news mentality played a role, though the accelerated downside pressure seemed to be driven by short attacks (note that the current short interest is 28%) and negative articles/blogs, which we viewed as unwarranted. But it didn't matter, with that much momentum and volume to the downside, by the time it was over, SAVA shares were

under \$70 by close on 7/30/21. That was a Friday, everyone goes home, and AAIC was over. Now what?

August. AAIC is over, SAVA shares are at \$70, but come Monday, 8/2/21 after AAIC ends, SAVA shares once again start to rise in value back up to ~\$122 per share by 8/13/21. We believe this was mainly due to shorts closing positions and the investment community overall coming back to SAVA based on the potential of Simufilam in Alzheimer's disease and the data...as noted above, AAIC was a very good data readout for Simufilam and there was the 12-month cognition data to look forward too, as well as the start of the P3 program and potential announcements around business development plans. All is good and back on track into mid-August with a small sell-off from 8/16-8/19 as investors again took some profits, which is typical for a biotech with this much movement and volume. SAVA shares settle down near \$100 per share and then move back up to near \$118 per share by the close on 8/24/21. Here it comes on 8/24...the Citizen's Petition (CP).

The CP was filed on 8/24 by a law firm on behalf of an investor or group of investors that were not named. The CP requested the FDA to halt all ongoing studies of Simufilam until the agency can verify the data Cassava had submitted thus far. Issues in the CP pointed to reliance on a single lab for some of its key data, data manipulation, and other factors that to the filers seemed to warrant FDA halting Simufilam development. This was, or so it seems, related to another short attack on SAVA shares. In response to the CP filing, SAVA shares fell sharply from \$118 per share on 8/24 to \$53 by the close on 8/30, continuing to pull back in value into the low \$40s into mid September. The question was at that point, whether it had any merit or not, was how long the CP could hang-over SAVA shares. Before we get back to the CP, there was some positive news in September with the 12-month cognition data for those same 50 patients in the P2b tracking with the 9-month data. The reaction on the Street was another rise in SAVA shares in mid September; still the CP was there.

CPs filed with the FDA have to be responded to or dismissed in 150 days (FDA guidance on CPs, [LINK](#)), which for Cassava puts the timeline some time in January 2022. What we've learned is that CPs often go to expiry with no action, unless that there is something so alarming that it must be dealt with. For Cassava, recall that Simufilam had been through NIH reviews, data sharing, and discussions with the FDA including the end-of-phase 2 meeting to set the stage for the P3 programs. In addition, the phase 3 was initiated in mid-October, which if there was any merit to the CP, the FDA likely would not have let that trial start, in our view. Interestingly, on 11/3 there was another short report published in the public domain, albeit it seemed to come from another group not related to the 8/24 CP. While this report was particularly more scathing and also centered on speculation and not scientific facts, it seemed to us that the impact on SAVA shares was minimal. Turns out that position was reportedly closed after the following event (on 11/4) sent SAVA shares up ~50%, into the \$80s.

The next event occurred most recently on 11/4/21 with the Journal of Neuroscience, which is the journal that had apparently published Cassava's manipulated and/or duplicated western blot images according to the CP. The Journal reviewed the raw data and determined that there was no data manipulation. This set off a rapid rise in SAVA shares and directly discredits the CP, in our view, as well as the other 11/3 short report, which as noted above, prompted that group to reportedly close its short position relatively quickly. As such, the run-up in SAVA shares, in addition to investor enthusiasm for the SAVA story, was also likely aided in-part by a short squeeze. Now back to the Journal article and peer review.

The peer-review journal process, for any journal that publishes research, is essentially sacred and the barrier to thwart scientific misconduct, which would include data manipulation. This has been studied and published on by several seminal research figures in the academic community for years. If we don't have scientific/medical integrity, what do we have? This is why the Journal of Neuroscience's response to the Simufilam data manipulation matters more than anything, in our view. The scientific and medical journals do not care about stocks or investors, long or short. They care about good data, good science and good medicine being published, nothing more.

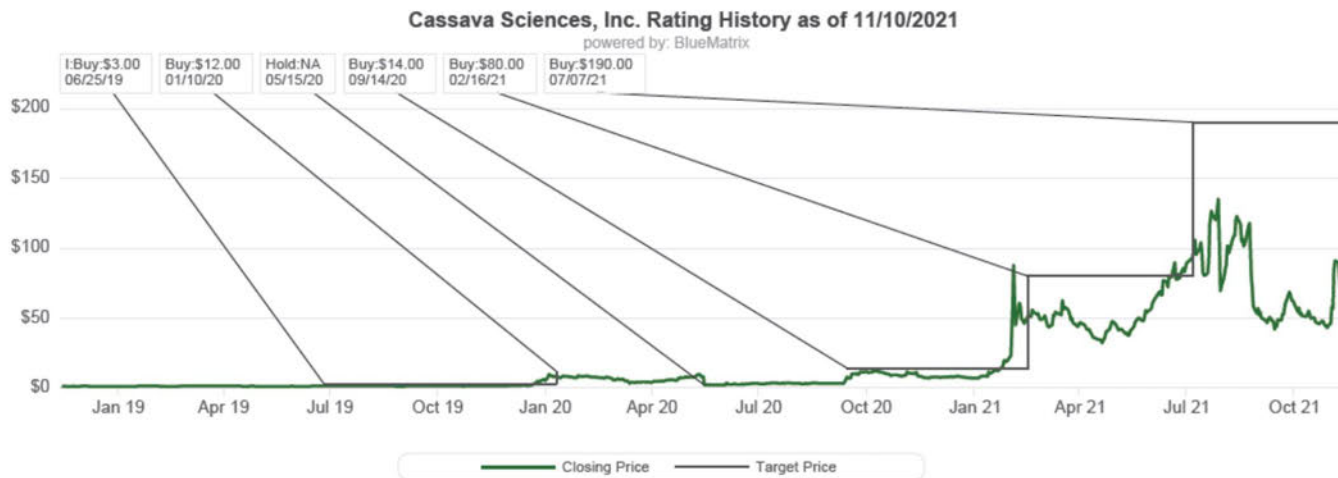
Mid-November to ... The SAVA roller coaster ride in 2021 has been indeed just that; look at the chart. However, within every peak and valley in the chart, there is background, which hopefully we laid out in full in this note. So, where does SAVA shares go from here? There's always the

risk of another short attack, negative blogs, and such, and given what has happened just in 2021, investors need to consider these risks. As it stands now, it seems the CP argument is fading and the SAVA story is back on track. As we noted in the summary above on page 1, our thesis has not changed throughout the 2021 roller coaster for Cassava as our work is predicated on published literature and regulatory review/filings, scientific expertise, and our belief that Simufilam could potentially change the game in Alzheimer's disease. Cassava currently has a market capitalization of ~\$2.8B. Biogen's market capitalization can swing \$10B-\$20B in a day based on Aduhelm updates for better or worse, something that we have discussed in past notes; this 'behavior' tells us what the value of a new drug for Alzheimer's disease could be valued at, and Cassava has one of the most advanced programs in the space. For Cassava, the full 200 patient data from the P2b extension study should come ahead of the first phase 3 readout, the phase 3 program is running and the company is well-capitalized. We also would expect some mention that the CP was dismissed or expired, we believe some time in January.

Cassava Sciences, Inc.: Income Statement (\$000)																		
YE December 31	2018A	2019A	2020E	1Q21A	2Q21A	3Q21A	4Q21E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E
Revenue:																		
Simufilam mid-mod Alzheimer's Disease (US)										-	-	285,202	402,815	1,066,745	1,355,989	1,795,481	2,028,730	2,417,638
Simufilam mid-mod Alzheimer's Disease (EU)										-	-	350,799	495,463	1,049,677	1,667,867	1,913,983	2,193,420	2,395,476
PT1-125Dx (diagnostic)										-	-	5,000	6,250	7,813	9,766	12,207	15,259	19,073
Net revenue	-	-	-	-	-	-	-	-	-	-	-	641,001	904,528	2,124,234	3,033,622	3,721,671	4,227,409	4,832,188
Collaborative revenue:																		
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Collaborative Revenue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Revenue	-	-	-	-	-	-	-	-	-	-	-	641,001	904,528	2,124,234	3,033,622	3,721,671	4,227,409	4,832,188
Gross Margins:																		
Cost of Goods Sold												128,200	171,860	382,362	455,043	558,251	634,111	724,828
%Gross Margin												80%	81%	82%	85%	85%	85%	85%
Gross Profit	-	-	-	-	-	-	-	-	-	-	-	512,800	732,668	1,741,872	2,578,579	3,163,421	3,593,297	4,107,360
Operating Expenses:																		
Research and Development	2,969	1,568	1,973	2,529	3,901	8,041	8,049	22,520	23,646	15,000	15,300	15,606	15,918	16,236	16,561	16,892	17,230	17,575
General and Administrative	3,683	3,391	3,776	1,004	1,237	1,712	1,729	5,682	15,000	25,000	26,250	27,563	28,941	30,388	31,907	33,502	35,178	36,936
Gain on sale of property and equipment			(346)															
Total Expenses	6,652	4,959	5,403	3,533	5,138	9,753	9,778	28,202	38,646	40,000	41,550	43,169	44,859	46,624	48,468	50,395	52,408	54,511
Operating Income (Loss)	(6,652)	(4,959)	(5,403)	(3,533)	(5,138)	(9,753)	(9,778)	(28,202)	(38,646)	(40,000)	(41,550)	(43,169)	(44,859)	(46,624)	(48,468)	(50,395)	(52,408)	(54,511)
Interest Income	105	328	106	7	13	15		35										
Other income, net	-	-	-	-	-	176		176	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-
Total Other Income	105	328	106	7	13	191	-	211	-	-	-	-	-	-	-	-	-	-
Pretax Income	(6,557)	(4,631)	(5,297)	(3,526)	(5,125)	(9,562)	(9,778)	(27,991)	(38,646)	(40,000)	(41,550)	(43,169)	(44,859)	(46,624)	(48,468)	(50,395)	(52,408)	(54,511)
Taxes on income	-	-	-	-	-	-	-	-	-	-	-	-	-	-	58,703	146,851	208,750	286,661
Tax Rate															2%	4%	5%	6%
GAAP Net Income (Loss)	(6,557)	(4,631)	(5,297)	(3,526)	(5,125)	(9,562)	(9,778)	(27,991)	(38,646)	(40,000)	(41,550)	(43,169)	(44,859)	(46,624)	(48,468)	(50,395)	(52,408)	(54,511)
Total comprehensive loss	(6,557)	(4,631)	(5,297)	(3,526)	(5,125)	(9,562)	(9,778)	(27,991)	(38,646)	(40,000)	(41,550)	(43,169)	(44,859)	(46,624)	(48,468)	(50,395)	(52,408)	(54,511)
GAAP EPS	(0.61)	(0.27)	(0.20)	(0.09)	(0.13)	(0.24)	(0.24)	(0.71)	(0.98)	(0.97)	(0.97)	(1.37)	(1.95)	(2.11)	(2.11)	(2.11)	(2.11)	(2.11)
GAAP EPS (Dil)	(0.61)	(0.27)	(0.20)	(0.09)	(0.13)	(0.24)	(0.24)	(0.71)	(0.98)	(0.97)	(0.97)	(1.37)	(1.95)	(2.11)	(2.11)	(2.11)	(2.11)	(2.11)
Wtdt Avg Shrs (Bas) - '000s	10,682	17,412	27,151	37,721	39,953	39,957	39,997	39,407	40,097	41,308	43,026	44,702	44,881	45,061	45,241	45,422	45,604	45,787
Wtdt Avg Shrs (Dil) - '000s	10,682	17,412	27,151	37,721	39,953	39,957	39,997	39,407	40,097	41,308	43,026	44,702	44,881	45,061	45,241	45,422	45,604	45,787
Source: Company reports and Maxlin																		

Source: Company reports and Maxim

DISCLOSURES



Maxim Group LLC Ratings Distribution

As of: 11/10/21

		% of Coverage Universe with Rating	% of Rating for which Firm Provided Banking Services in the Last 12 months
Buy	Fundamental metrics and/or identifiable catalysts exist such that we expect the stock to outperform its relevant index over the next 12 months.	89%	53%
Hold	Fundamental metrics are currently at, or approaching, industry averages. Therefore, we expect this stock to neither outperform nor underperform its relevant index over the next 12 months.	11%	48%
Sell	Fundamental metrics and/or identifiable catalysts exist such that we expect the stock to underperform its relevant index over the next 12 months.	0%	0%

**See valuation section for company specific relevant indices*

I, Jason McCarthy, Ph.D., attest that the views expressed in this research report accurately reflect my personal views about the subject security and issuer. Furthermore, no part of my compensation was, is, or will be directly or indirectly related to the specific recommendation or views expressed in this research report.

The research analyst(s) primarily responsible for the preparation of this research report have received compensation based upon various factors, including the firm's total revenues, a portion of which is generated by investment banking activities.

Maxim Group makes a market in Cassava Sciences, Inc.

Maxim Group managed/co-managed/acted as placement agent for an offering of the securities for Cassava Sciences, Inc. in the past 12 months.

Maxim Group received compensation for investment banking services from Cassava Sciences, Inc. in the past 12 months.

Maxim Group expects to receive or intends to seek compensation for investment banking services from Cassava Sciences, Inc. in the next 3 months.

SAVA: For Cassava Sciences, we use the BTK (NYSE Arca Biotechnology Index) as the relevant index.

Valuation Methods

SAVA: Our model assumes Simufilam is commercialized for Alzheimer's disease in 2025 in the US and EU. A 50% risk adjustment is factored in based on stage of development, clinical trial risk and other factors. A modest platform value for the companion diagnostic, SavaDx is also factored

in concurrent with the 2025 Simufilam drug launch. We then apply a 20% discount to the free cash flow, discounted EPS, and sum-of-the-parts models, which are equally weighted to derive a 12-month price target.

Price Target and Investment Risks

SAVA: Aside from general market and other economic risks, risks particular to our price target and rating for Cassava Sciences include: (1) the regulatory and clinical risk associated with product development; (2) the ability to access capital and the very high likelihood that the company will need to raise additional capital; (3) the rate and degree of progress of product development; (4) the rate of regulatory approval and timelines to potential commercialization of products; (5) the reliance on collaborators and/or potential collaborators from which there could be unforeseen delays and expenses; (6) the requirements for marketing authorization from regulatory bodies in the United States and other countries; (7) the liquidity and market volatility of the company's equity securities; (8) regulatory and manufacturing requirements and uncertainties; (9) product and technology developments by competitors; (10) inability, if product(s) is/are approved to gain adequate market share and maintain adequate revenue growth; (11) the ability of the company to maintain its exchange listing; (12) the company had setbacks in its analgesic programs around Remoxy and is attempting to transition to a new focus in Alzheimer's disease and may not be successful; (13) the company has a limited operating history in Alzheimer's disease; (14) following the P2b fail for PTI-125, the path forward for Cassava is subject to significant uncertainty as the company's ability to continue to operate. (15) COVID-19 issues may impact enrollment of clinical programs and/or impact the company's ability to operate. (16) SAVA shares have risen sharply on the basis of P2b extension study data which was based on data that lacked a controlled study comparator. The study is also in a small number of patients. These factors and other aspects of the data represent risks in designing and executing a phase 3 program based on these observations.

RISK RATINGS

Risk ratings take into account both fundamental criteria and price volatility.

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High – Fundamental Criteria: This is a risk rating assigned to companies having below-average revenue and earnings visibility, negative cash flow, and low market cap or public float. Accordingly, fundamental risk is expected to be above the industry. **Price Volatility:** The price volatility of companies falling within this category is expected to be above the industry. High-risk stocks may not be suitable for a significant class of individual investors.

Medium – Fundamental Criteria: This is a risk rating assigned to companies that may have average revenue and earnings visibility, positive cash flow, and is fairly liquid. Accordingly, both price volatility and fundamental risk are expected to approximate the industry average.

Low – Fundamental Criteria: This is a risk rating assigned to companies that may have above-average revenue and earnings visibility, positive cash flow, and is fairly liquid. Accordingly, both price volatility and fundamental risk are expected to be below the industry.

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of some investments, the potential losses may exceed the amount of initial investment and, in such circumstances, you may be required to pay more money to support these losses.

ADDITIONAL INFORMATION IS AVAILABLE UPON REQUEST



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EXHIBIT 23



Source: Cassava Sciences, Inc.

August 24, 2021 08:15 ET

Cassava Sciences Announces Agreement with FDA on Special Protocol Assessments (SPA) for its Phase 3 Studies of Simufilam for the Treatment of Alzheimer's Disease

Phase 3 Study Initiation Still Expected Fall 2021

AUSTIN, Texas, Aug. 24, 2021 (GLOBE NEWSWIRE) -- Cassava Sciences, Inc. (Nasdaq: SAVA), a biotechnology company focused on Alzheimer's disease, announced today that it has reached agreement with the U.S. Food and Drug Administration (FDA) under a Special Protocol Assessment (SPA) for both of its pivotal Phase 3 studies of oral simufilam for the treatment of patients with Alzheimer's disease.

These SPA agreements document that FDA has reviewed and agreed upon the key design features of Cassava Sciences' Phase 3 study protocols of simufilam for the treatment of patients with Alzheimer's disease.

"I believe these SPAs mark a meaningful and encouraging milestone for Cassava Sciences," said Remi Barbier, President & CEO. "The SPAs underscore our alignment with FDA on key scientific, clinical and regulatory requirements of our Phase 3 program of simufilam in Alzheimer's disease."

Cassava Sciences also reaffirmed prior guidance to advance simufilam into a Phase 3 pivotal program in Alzheimer's disease in Fall 2021.

The first clinical study protocol under the SPA is titled "*A Phase 3, Randomized, Double-Blind, Placebo-Controlled, Parallel-Group, 52-Week Study Evaluating the Safety and Efficacy of One Dose of Simufilam in Subjects with Mild-to-Moderate Alzheimer's Disease*".

The second clinical study protocol under the SPA is titled "*A Phase 3, Randomized, Double-Blind, Placebo-Controlled, Parallel-Group, 76-Week Study Evaluating the Safety and Efficacy of Two Doses of Simufilam in Subjects with Mild-to-Moderate Alzheimer's Disease*".

For details regarding the Phase 3 program please visit Cassava Sciences' Corporate Presentation: <https://www.cassavasciences.com/static-files/a518d6f8-be82-4a23-b676-e8b5a75cf9e6>

About Special Protocol Assessments

An SPA agreement indicates concurrence by the FDA with the adequacy and acceptability of specific critical elements of overall protocol design (e.g., entry criteria, dose selection, endpoints, etc.). These elements are critical to ensure that Cassava Sciences' planned Phase 3 studies of simufilam in Alzheimer's disease can be considered adequate and well-controlled studies in support of a future regulatory submission and marketing application. For more information on Special Protocol Assessments, please visit: <https://www.fda.gov/regulatory-information/search-fda-guidance-documents/special-protocol-assessment-guidance-industry>.

About Cassava Sciences, Inc.

Cassava Sciences' mission is to discover and develop innovations for chronic, neurodegenerative conditions. Over the past 10 years, Cassava Sciences has combined state-of-the-art technology with new insights in neurobiology to develop novel solutions for Alzheimer's disease. For more information, please visit: <https://www.CassavaSciences.com>.

For More Information Contact:

Eric Schoen, Chief Financial Officer

Cautionary Note Regarding Forward-Looking Statements: *This news release contains forward-looking statements, including statements made pursuant to the safe harbor provisions of the Private Securities Litigation Reform Act of 1995, relating to: the treatment or diagnosis of Alzheimer's disease; our intention to initiate a Phase 3 clinical program with simufilam and the timing, enrollment, duration and other details thereof; verbal commentaries made by our employees; and potential benefits, if any, of our product candidates. These statements may be identified by words such as "may," "anticipate," "believe," "could," "expect," "would", "forecast," "intend," "plan," "possible," "potential," and other words and terms of similar meaning.*

Drug development involves a high degree of risk, and historically only a small number of research and development programs result in commercialization of a product. Clinical results from our earlier-stage clinical trials may not be indicative of full results or results from later-stage or larger scale clinical trials and do not ensure regulatory approval. You should not place undue reliance on these statements or any scientific data we present or publish. Such statements are based largely on our current expectations and projections about future events.

Such statements speak only as of the date of this news release and are subject to a number of risks, uncertainties and assumptions, including, but not limited to, those risks relating to the ability to conduct or complete clinical studies on expected timelines, to demonstrate the specificity, safety, efficacy or potential health benefits of our product candidates, the severity and duration of health care precautions given the COVID-19 pandemic, any unanticipated impacts of the pandemic on our business operations, and including those described in the section entitled "Risk Factors" in our Annual Report on Form 10-K for the year ended December 31, 2020 and future reports to be filed with the SEC. The foregoing sets forth many, but not all, of the factors that could cause actual results to differ from expectations in any forward-looking statement. In light of these risks, uncertainties and assumptions, the forward-looking statements and events discussed in this news release are inherently uncertain and may not occur, and actual results could differ materially and adversely from those anticipated or implied in the forward-looking statements. Accordingly, you should not rely upon forward-looking statements as predictions of future events. Except as required by law, we disclaim any intention or responsibility for updating or revising any forward-looking statements contained in this news release.

For further information regarding these and other risks related to our business, investors should consult our filings with the SEC, which are available on the SEC's website at www.sec.gov.

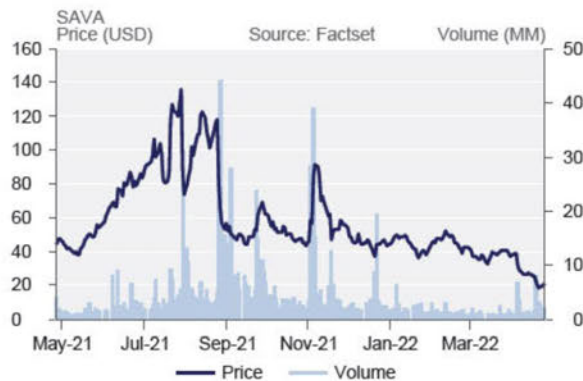
EXHIBIT 24

Biotechnology

SAVA - NASDAQ

April 26, 2022

Closing Price 4/26/22 **\$21.55**
 Rating: (prior Buy) Suspended
 12-Month Target Price: (prior \$110.00) NA
 52-Week Range: \$18.07 - \$146.16
 Market Cap (M): 862.5
 Shares O/S (M): 40.0
 Float: 90.8%
 Avg. Daily Volume (000): 1,698.1
 Debt (M): \$0.0
 Dividend: \$0.00
 Dividend Yield: 0.0%
 Risk Profile: Speculative
 Fiscal Year End: December



Cassava Sciences, Inc.

Suspended

Suspension of Coverage Report

Summary

- Due to uncertainty related to the ability of the phase 3 Alzheimer's disease trial for simufilam to enroll patients, we are temporarily suspending coverage of Cassava Sciences (SAVA).

Details

Effective immediately, Maxim Group is temporarily suspending coverage of Cassava Sciences (SAVA).

There is continued uncertainty related to the simufilam data with five retracted papers in March 2022 by PLoS ONE (author Hoau-Yan Wang, a professor at the City University of New York, Cassava collaborator). In addition, there is uncertainty related to the ongoing SEC investigation. Combined with the impact of the Citizen's Petitions which were initially filed in August 2021 (since denied, as announced by Cassava in February 2022), short reports and other factors, the net result seems to have materially impacted the ability of the ongoing phase 3 program in Alzheimer's disease to enroll patients, with only ~60 patients of the needed 1,750 enrolled as per a company update in March 2022. The company has ~\$230M in cash as of 12/31/21, which should be sufficient runway through 2024, possibly longer depending on the costs of the P3 studies as they move forward. That said, our concern is if the trial can enroll efficiently, and right now it is not clear. Therefore, we are temporarily suspending coverage of SAVA.

Maxim Group reserves the right to resume coverage or terminate coverage of SAVA upon notification at the end of the suspension.

For additional details on SAVA, please refer to our last company note and/or initiation report. However, our prior rating, target price, and investment thesis for SAVA should no longer be used to make investment decisions.

Company description: Cassava Sciences is developing simufilam, an oral medication drug candidate for the treatment of Alzheimer's disease.

Jason McCarthy, Ph.D.
 (212) 895-3556
 jmccarthy@maximgrp.com

SEE PAGES 2 - 3 FOR IMPORTANT DISCLOSURES AND DISCLAIMERS

FEINSTEIN_0001466

DISCLOSURES



Maxim Group LLC Ratings Distribution

As of: 04/25/22

		% of Coverage Universe with Rating	% of Rating for which Firm Provided Banking Services in the Last 12 months
Buy	Fundamental metrics and/or identifiable catalysts exist such that we expect the stock to outperform its relevant index over the next 12 months.	91%	40%
Hold	Fundamental metrics are currently at, or approaching, industry averages. Therefore, we expect this stock to neither outperform nor underperform its relevant index over the next 12 months.	9%	40%
Sell	Fundamental metrics and/or identifiable catalysts exist such that we expect the stock to underperform its relevant index over the next 12 months.	0%	0%

**See valuation section for company specific relevant indices*

I, Jason McCarthy, Ph.D., attest that the views expressed in this research report accurately reflect my personal views about the subject security and issuer. Furthermore, no part of my compensation was, is, or will be directly or indirectly related to the specific recommendation or views expressed in this research report.

The research analyst(s) primarily responsible for the preparation of this research report have received compensation based upon various factors, including the firm's total revenues, a portion of which is generated by investment banking activities.

Maxim Group makes a market in Cassava Sciences, Inc.

Maxim Group expects to receive or intends to seek compensation for investment banking services from Cassava Sciences, Inc. in the next 3 months.

SAVA: For Cassava Sciences, we use the BTK (NYSE Arca Biotechnology Index) as the relevant index.

Valuation Methods

SAVA: Our model assumes simufilam is commercialized for Alzheimer's disease. A revenue risk adjustment is factored in based on stage of development, clinical trial risk and other factors. A modest platform value for the companion diagnostic, SavaDx is also factored in concurrent with the simufilam drug launch. We then apply a discount to the free cash flow, discounted EPS, and sum-of-the-parts models, which are equally weighted to derive a 12-month price target.

Price Target and Investment Risks

SAVA: Aside from general market and other economic risks, risks particular to our price target and rating for Cassava Sciences include: (1) the regulatory and clinical risk associated with product development; (2) the ability to access capital and the very high likelihood that the company

will need to raise additional capital; (3) the rate and degree of progress of product development; (4) the rate of regulatory approval and timelines to potential commercialization of products; (5) the reliance on collaborators and/or potential collaborators from which there could be unforeseen delays and expenses; (6) the requirements for marketing authorization from regulatory bodies in the United States and other countries; (7) the liquidity and market volatility of the company's equity securities; (8) regulatory and manufacturing requirements and uncertainties; (9) product and technology developments by competitors; (10) inability, if product(s) is/are approved to gain adequate market share and maintain adequate revenue growth; (11) the ability of the company to maintain its exchange listing; (12) the company had setbacks in its analgesic programs around Remoxy and is attempting to transition to a new focus in Alzheimer's disease and may not be successful; (13) the company has a limited operating history in Alzheimer's disease; (14) following the P2b fail for PTI-125, the path forward for Cassava is subject to significant uncertainty as the company's ability to continue to operate; (15) COVID-19 issues may impact enrollment of clinical programs and/or impact the company's ability to operate; (16) SAVA shares have risen sharply on the basis of P2b extension study data which was based on data that lacked a controlled study comparator. The study is also in a small number of patients. These factors and other aspects of the data represent risks in designing and executing a phase 3 program based on these observations; (17) the ongoing SEC investigation could materially impact the company depending on the outcome; (18) slow trial enrollment for simufilam could impact the ability of the company to complete the clinical program(s).

RISK RATINGS

Risk ratings take into account both fundamental criteria and price volatility.

Speculative – Fundamental Criteria: This is a risk rating assigned to early-stage companies with minimal to no revenues, lack of earnings, balance sheet concerns, and/or a short operating history. Accordingly, fundamental risk is expected to be significantly above the industry. Price Volatility: Because of the inherent fundamental criteria of the companies falling within this risk category, the price volatility is expected to be significant with the possibility that the investment could eventually be worthless. Speculative stocks may not be suitable for a significant class of individual investors.

High – Fundamental Criteria: This is a risk rating assigned to companies having below-average revenue and earnings visibility, negative cash flow, and low market cap or public float. Accordingly, fundamental risk is expected to be above the industry. Price Volatility: The price volatility of companies falling within this category is expected to be above the industry. High-risk stocks may not be suitable for a significant class of individual investors.

Medium – Fundamental Criteria: This is a risk rating assigned to companies that may have average revenue and earnings visibility, positive cash flow, and is fairly liquid. Accordingly, both price volatility and fundamental risk are expected to approximate the industry average.

Low – Fundamental Criteria: This is a risk rating assigned to companies that may have above-average revenue and earnings visibility, positive cash flow, and is fairly liquid. Accordingly, both price volatility and fundamental risk are expected to be below the industry.

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ADDITIONAL INFORMATION IS AVAILABLE UPON REQUEST



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EXHIBIT 25

Early Alzheimer's Disease: Developing Drugs for Treatment Guidance for Industry

DRAFT GUIDANCE

This guidance document is being distributed for comment purposes only.

Comments and suggestions regarding this draft document should be submitted within 90 days of publication in the *Federal Register* of the notice announcing the availability of the draft guidance. Submit electronic comments to <https://www.regulations.gov>. Submit written comments to the Dockets Management Staff (HFA-305), Food and Drug Administration, 5630 Fishers Lane, Rm. 1061, Rockville, MD 20852. All comments should be identified with the docket number listed in the notice of availability that publishes in the *Federal Register*.

For questions regarding this draft document, contact (CDER) Billy Dunn at 301-796-2250 or (CBER) Office of Communication, Outreach, and Development at 800-835-4709 or 240-402-8010.

**U.S. Department of Health and Human Services
Food and Drug Administration
Center for Drug Evaluation and Research (CDER)
Center for Biologics Evaluation and Research (CBER)**

**February 2018
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Revision 1

Early Alzheimer's Disease: Developing Drugs for Treatment Guidance for Industry

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**U.S. Department of Health and Human Services
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Center for Drug Evaluation and Research (CDER)
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**Early Alzheimer's Disease:
Developing Drugs for Treatment
Guidance for Industry¹**

This draft guidance, when finalized, will represent the current thinking of the Food and Drug Administration (FDA or Agency) on this topic. It does not establish any rights for any person and is not binding on FDA or the public. You can use an alternative approach if it satisfies the requirements of the applicable statutes and regulations. To discuss an alternative approach, contact the FDA staff responsible for this guidance as listed on the title page.

I. INTRODUCTION

The purpose of this guidance is to assist sponsors in the clinical development of drugs for the treatment of the stages of sporadic Alzheimer's disease (AD) that occur before the onset of overt dementia (collectively referred to as early AD in this guidance, though it is recognized that patients with later stage early AD and patients with AD in the earliest stages of dementia may not differ significantly).² This guidance is intended to serve as a focus for continued discussions among representatives of the Division of Neurology Products in the Center for Drug Evaluation and Research or the Office of Tissues and Advanced Therapies (OTAT) in the Center for Biologics Evaluation and Research, as appropriate, pharmaceutical sponsors, the scientific community, and the public.³ The design of clinical trials that are specifically focused on the treatment of patients with AD who have developed overt dementia, or any of the autosomal dominant forms of AD, is not discussed, although some of the principles in this guidance may be pertinent.

This guidance revises the draft guidance for industry *Alzheimer's Disease: Developing Drugs for the Treatment of Early Stage Disease* issued in February 2013. This revision addresses the Food and Drug Administration's (FDA's) current thinking regarding the selection of patients with early AD for enrollment into clinical trials and the selection of endpoints for clinical trials in these populations.

¹ This guidance has been prepared by the Division of Neurology Products in the Center for Drug Evaluation and Research in cooperation with the Center for Biologics Evaluation and Research at the Food and Drug Administration.

² For the purposes of this guidance, all references to *drugs* include both human drugs and therapeutic biological products unless otherwise specified.

³ In addition to consulting guidances, sponsors are encouraged to contact the Division of Neurology Products or OTAT to discuss specific issues that arise during the development of drugs to treat early AD.

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37
38 In general, FDA's guidance documents do not establish legally enforceable responsibilities.
39 Instead, guidances describe the Agency's current thinking on a topic and should be viewed only
40 as recommendations, unless specific regulatory or statutory requirements are cited. The use of
41 the word *should* in Agency guidances means that something is suggested or recommended, but
42 not required.

43 44 45 **II. BACKGROUND**

46
47 Historically, the use of clinical criteria that defined later stages of AD, after the onset of overt
48 dementia, were used for enrollment into clinical trials. Accordingly, patients included in these
49 trials exhibited both the cognitive changes typical of clinically evident AD and the degree of
50 functional impairment associated with overt dementia. Drugs that were approved for dementia
51 during that time were evaluated in that context. Studies supporting approval of those drugs used
52 a co-primary approach to assessment of cognitive and functional (or global) measures. This
53 approach ensured both that a clinically meaningful effect was established by a demonstration of
54 benefit on the functional measure and that the observed functional benefit was accompanied by
55 an effect on the core symptoms of the disease as measured by the cognitive assessment.

56
57 The co-primary endpoint approach was used, in part, because the cognitive assessments used in
58 the studies were not considered inherently clinically meaningful. Such assessments typically
59 measure the cognitive deficits of AD through the use of highly sensitive formalized measures of
60 neuropsychological performance that are capable of discriminating small changes of uncertain
61 independent clinical meaningfulness. This historical dichotomy of functional and cognitive
62 assessments has led to common use of the terms *cognition* and *function* with respect to outcome
63 assessment in AD clinical trials, with the implication that an effect on cognition is non-
64 meaningful unless accompanied by a benefit on an independent endpoint assessing function in a
65 meaningful manner. FDA rejects this dichotomy and finds such usage inappropriate, because it
66 implies that an effect on cognition itself, regardless of the nature of the observed effect and the
67 manner in which it is assessed, cannot be clinically meaningful. This is certainly not the case.

68
69 Cognition, in its entirety, encompassing all its constituent processes and domains, is most
70 certainly meaningful in terms of daily function. Although small changes in various cognitive
71 domains may be detected using sensitive neuropsychological tests that are capable of detecting
72 changes of uncertain clinical meaningfulness, more marked cognitive changes may represent
73 impairment that is clearly clinically meaningful. It follows, in concept, that cognitive changes of
74 particular character, perhaps defined by magnitude or breadth of effect(s), may represent
75 clinically meaningful benefit. The issue of concern with regard to considering the
76 meaningfulness of cognitive measurements is the method of assessment, not the entity of
77 cognition itself, especially for cognition taken as a whole. In short, cognition is meaningful, but
78 when measured using conventional approaches with sensitive tools directed at particular
79 domains, the meaningfulness of measured changes may not be apparent.

80
81 As the scientific understanding of AD has evolved, efforts have been made to incorporate in
82 clinical trials, to varying degrees, the use of biomarkers reflecting underlying AD

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pathophysiological changes and the enrollment of patients with AD at earlier stages of the disease, stages in which there may be no functional impairment or even no detectable clinical abnormality. These efforts are particularly important because of the opportunity to intervene very early in the disease process that AD provides, given the development of characteristic pathophysiological changes that greatly precede the development of clinically evident findings and the slowly progressive course of AD. It is obvious that delaying, or, preferably, halting or reversing, the pathophysiological process that will lead to the initial clinical deficits of AD is the ultimate goal of presymptomatic intervention, and treatment directed at this goal must begin before there are overt clinical symptoms. This opportunity carries with it the need to understand the optimum manner in which to assess treatment benefit in these earlier stages of disease.

III. DIAGNOSTIC CRITERIA FOR EARLY ALZHEIMER'S DISEASE

Eligibility for enrollment in efficacy trials in AD, including early AD, should be based on current consensus diagnostic criteria, with a focus on objective tests and, when appropriate, history and physical examination, to determine the presence or likely presence of AD, and to exclude other conditions that can mimic AD.

FDA supports and endorses the use of diagnostic criteria that are based on a contemporary understanding of the pathophysiology and evolution of AD. The characteristic pathophysiological changes of AD greatly precede the development of clinically evident findings and progress as a continuous disease process through stages defined initially only by those pathophysiological changes and then by the development of subtle abnormalities, detectable using sensitive neuropsychological measures. These are followed by the development of more apparent cognitive abnormalities, accompanied by initially mild and then more severe functional impairment. In part because of failures of clinical trials intended to alter disease progression in later stages of AD, there is an increased focus on evaluating drug treatments for AD in the earliest stages of the disease. Diagnostic criteria that reliably define a population with early AD, including the earliest stages characterized only by pathophysiological changes, are suited to the evaluation of drugs intended to delay or prevent the emergence of overt symptoms.

Important findings applicable to the categorization of AD along its continuum of progression include the presence of pathophysiological changes as measured by biomarkers, the presence or absence of detectable abnormalities on sensitive neuropsychological measures, and the presence or absence of functional impairment manifested as meaningful daily life impact that present with subjective complaints or reliable observer reports. Although FDA recognizes that variations in the selection and application of clinical characteristics and biomarkers may lead to the identification of patients who are at somewhat different stages of a progressive disease process, the following categories are conceptually useful for the design and evaluation of clinical trials in different stages of AD:

- **Stage 1: Patients with characteristic pathophysiologic changes of AD but no evidence of clinical impact.** These patients are truly asymptomatic with no subjective complaint, functional impairment, or detectable abnormalities on sensitive neuropsychological

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measures. The characteristic pathophysiologic changes are typically demonstrated by assessment of various biomarker measures.

- **Stage 2: Patients with characteristic pathophysiologic changes of AD and subtle detectable abnormalities on sensitive neuropsychological measures, but no functional impairment.** The emergence of subtle functional impairment signals a transition to Stage 3.
- **Stage 3: Patients with characteristic pathophysiologic changes of AD, subtle or more apparent detectable abnormalities on sensitive neuropsychological measures, and mild but detectable functional impairment.** The functional impairment in this stage is not severe enough to warrant a diagnosis of overt dementia.
- **Stage 4: Patients with overt dementia.** This diagnosis is made as functional impairment worsens from that seen in Stage 3. This stage may be refined into additional categories (e.g., Stages 4, 5, and 6, corresponding with mild, moderate, and severe dementia) but a discussion of these disease stages is not the focus of this guidance.

It is vital to distinguish accurately these conceptual categories, even in the presence of a single continuous disease process, to allow and inform appropriate outcome measure selection. In descriptions of studies, both proposed and completed, sponsors should identify both the stage of AD defined for study eligibility and enrollment and the stage of AD anticipated for the majority of the enrolled patient population at the time of primary outcome assessment.

It is reasonable to expect that biomarker evidence of disease will play a role in the reliable identification of patients in trials of early AD. Indeed, it is unusual to encounter a proposed clinical trial that does not include in the enrollment criteria biomarker evidence of disease. If this evidence could be needed to adequately define the anticipated indicated population, we encourage sponsors to engage early in development with the Division of Neurology Products, OTAT, or the Center for Devices and Radiological Health as appropriate, at FDA to discuss the potential need for the codevelopment of a companion diagnostic device.

IV. OUTCOME MEASURES

A. Clinical Endpoints for Early AD Trials in Stage 3 Patients

Early AD patients approaching the onset of overt dementia (Stage 3 patients) are likely to have relatively mild but noticeable impairments in their daily functioning. Although studies in this stage of disease will generally include sensitive measures of neuropsychological performance of uncertain independent clinical meaningfulness, it is important to demonstrate that a drug favorably affects these functional deficits. Many of the assessment tools typically used to measure functional impairment in patients with overt dementia may not be suitable for use in these early stage patients. Ideally, the outcome measure used in this stage of disease will provide an assessment of meaningful cognitive function. An integrated scale that adequately and meaningfully assesses both daily function and cognitive effects in early AD patients is acceptable as a single primary efficacy outcome measure.

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FDA encourages the development of novel approaches to the integrated evaluation of subtle early AD (predementia) functional deficits/impact that arise from early cognitive impairment (e.g., facility with financial transactions, adequacy of social conversation). The independent assessment of daily function and cognitive effects is also an acceptable approach. In this setting, an effect on a sensitive measure of neuropsychological performance of uncertain independent clinical meaning (e.g., a word-list recall test) should not allow for an overall finding of efficacy in the absence of meaningful functional benefit. For drugs with the potential to lead to measurable functional benefit without a corresponding cognitive benefit, assessment of an independent cognitive endpoint is important.

B. Clinical Endpoints for Early AD Trials in Stage 2 Patients

In patients in the earliest clinical stages of AD (Stage 2 patients), where only subtle cognitive deficits detected on sensitive measures of neuropsychological performance are present, and there is no evidence of functional impairment, it may be difficult to establish a clinically meaningful effect on those subtle cognitive deficits during the course of a trial of reasonable duration. Nonetheless, a possible approach is to conduct a study of sufficient duration to allow the evaluation of the measures discussed above for Stage 3 patients. As patients transition to Stage 3 during participation in the trial, the principles applicable to outcome assessment for Stage 3 would apply.

Alternatively, and in view of the rapidly and continually expanding body of knowledge concerning AD, FDA will consider strongly justified arguments that a persuasive effect on sensitive measures of neuropsychological performance may provide adequate support for a marketing approval. Given the panoply of available neuropsychological tests, a pattern of putatively beneficial effects demonstrated across multiple individual tests would increase the persuasiveness of the finding; conversely, a finding on a single test unsupported by consistent findings on other tests would be less persuasive. A large magnitude of effect on sensitive measures of neuropsychological performance may also increase their persuasiveness. It would generally be expected that such arguments would be supported by similarly persuasive effects on the characteristic pathophysiologic changes of AD, as discussed below for Stage 1 patients.

Importantly, such arguments should be predicated on the certainty of diagnosis of enrolled patients, the certainty of their future clinical course, and the certainty of the relationship of the observed effects on sensitive measures of neuropsychological performance and characteristic pathophysiologic changes to the evolution of more severe cognitive deficits and functional impairment. Whether such arguments, if convincing, would support full approval (i.e., the cognitive effects were found to be inherently clinically meaningful, either on face or because they reliably and inevitably are associated with functional benefit later in the course of the disease) or accelerated approval (i.e., the cognitive effects were found to be reasonably likely to predict clinical benefit, with a post-approval requirement for a study to confirm the predicted clinical benefit) would be a matter of detailed consideration. Sponsors considering these issues should discuss their plans with FDA early in development. Evolution of the scientific understanding of AD may also influence these considerations.

*Contains Nonbinding Recommendations**Draft — Not for Implementation***C. Endpoints for Early AD Trials in Stage 1 Patients**

Because it is highly desirable to intervene as early as possible in AD, it follows that patients with characteristic pathophysiologic changes of AD but no subjective complaint, functional impairment, or detectable abnormalities on sensitive neuropsychological measures (Stage 1 patients) are an important target for clinical trials. A clinically meaningful benefit cannot be measured in these patients because there is no clinical impairment to assess (assuming that the duration of a trial is not sufficient to observe and assess the development of clinical impairment during the conduct of the trial). In Stage 1 patients, an effect on the characteristic pathophysiologic changes of AD, as demonstrated by an effect on various biomarkers, may be measured. Such an effect, analyzed as a primary efficacy measure, may, in principle, serve as the basis for an accelerated approval (i.e., the biomarker effects would be found to be reasonably likely to predict clinical benefit, with a post-approval requirement for a study to confirm the predicted clinical benefit). As with the use of neuropsychological tests, a pattern of treatment effects seen across multiple individual biomarker measures would increase the persuasiveness of the putative effect.

Although the issues and approaches discussed above for Stage 2 patients are relevant for Stage 1 patients, there is unfortunately at present no sufficiently reliable evidence that any observed treatment effect on such biomarker measures would be reasonably likely to predict clinical benefit (the standard for accelerated approval), despite a great deal of research interest in understanding the role of biomarkers in AD. FDA strongly supports and encourages continued research in this area and stresses its potential importance in the successful development of effective treatments appropriate for use in the earliest stages of AD. Precompetitive structured sharing across the AD scientific community of rigorously collected standardized data is a crucial component of this research. While research pursues the development of evidence sufficient to support the use of biomarker measures as the primary evidence supporting an accelerated approval, or perhaps a full approval if the fundamental understanding of AD evolves sufficiently to establish surrogacy, a possible approach to Stage 1 patients might be to conduct a study of sufficient duration to allow the evaluation of the measures discussed above for Stage 2 patients. As patients transition to Stage 2 during participation in the trial, the principles applicable to outcome assessment for Stage 2 would apply.

D. Time-to-Event Analysis

The use of a time-to-event survival analysis approach (e.g., time to the occurrence of a clinically meaningful event during the progressive course of AD, such as the occurrence of some degree of meaningful impairment of daily function) would be an acceptable primary efficacy measure in clinical trials in early AD. Sponsors considering such an approach should discuss their plans with FDA early in development.

E. Assessment of Disease Course

Although the demonstration of a substantial clinically meaningful treatment effect of any sort is of paramount importance, this may not be feasible in a clinical trial of reasonable duration, especially very early in the course of the disease, and clinical trials in early stage disease will

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usually be intended to provide evidence that a drug has permanently altered the course of AD through a direct effect on the underlying disease pathophysiology, an effect that persists in the absence of continued exposure to the drug.

A randomized-start or randomized-withdrawal trial design (with clinical outcome measures) is the most convincing approach to demonstrating a persistent effect on disease course. Generally, a randomized-start design would be most appropriate for use in AD. In this study design, patients are randomized to drug and placebo, and at some point, placebo patients are crossed over to active treatment. If patients in the trial who were initially on placebo and then assigned to active treatment fail to catch up (after a reasonable period of time) to patients who received active treatment for the entire duration of the trial, a persistent treatment effect on disease course would have been shown.

Assessment of various biomarkers may provide supportive evidence for a drug that has an established clinically meaningful benefit, but the effects on biomarkers in AD are not sufficiently well understood to provide evidence of a persistent effect on disease course.

Currently, there is no consensus as to particular biomarkers that would be appropriate to support clinical findings in trials in early AD. For this reason, sponsors at present have insufficient information on which to base a hierarchical structuring of a series of biomarkers as secondary outcome measures in their trial designs. Sponsors are therefore encouraged to analyze the results of these biomarkers independently, though in a prespecified fashion, with the understanding that these findings will be interpreted in the context of the state of the scientific evidence at the time of a future marketing application.

EXHIBIT 26

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DRAFT GUIDANCE

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**U.S. Department of Health and Human Services
Food and Drug Administration
Center for Drug Evaluation and Research (CDER)
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Early Alzheimer's Disease: Developing Drugs for Treatment Guidance for Industry

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Early Alzheimer's Disease: Developing Drugs for Treatment Guidance for Industry¹

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I. INTRODUCTION

The purpose of this guidance is to assist sponsors in the clinical development of drugs for the treatment of the stages of sporadic Alzheimer's disease (AD) that occur before the onset of overt dementia (i.e., Stages 1 through 3; discussed in section III). These stages are collectively referred to as "early AD" in this guidance; however, it is recognized that AD occurs on a continuum and patients in the last stage of early AD (i.e., late Stage 3) and patients with AD in the earliest stages of overt dementia (i.e., early Stage 4) may not differ significantly in clinical presentation. This guidance is intended to serve as a focus for continued discussions among representatives of the Office of Neuroscience in the Center for Drug Evaluation and Research or the Office of Therapeutic Products in the Center for Biologics Evaluation and Research, as appropriate, pharmaceutical sponsors, the scientific community, and the public about the development of drugs for the treatment of early AD.²

This guidance revises the draft guidance for industry *Early Alzheimer's Disease: Developing Drugs for Treatment* (February 2018). This revision, when finalized, will represent FDA's current thinking regarding the selection of subjects with early AD for enrollment in clinical trials and the selection of endpoints for clinical trials in this population.³

In general, FDA's guidance documents do not establish legally enforceable responsibilities. Instead, guidances describe the Agency's current thinking on a topic and should be viewed only as recommendations, unless specific regulatory or statutory requirements are cited. The use of the word *should* in Agency guidances means that something is suggested or recommended, but not required.

¹ This guidance has been prepared by the Office of Neuroscience in the Center for Drug Evaluation and Research in cooperation with the Center for Biologics Evaluation and Research at the Food and Drug Administration (FDA).

² In addition to consulting guidances, sponsors are encouraged to contact the Office of Neuroscience or the Office of Therapeutic Products to discuss specific issues that arise during the development of drugs to treat early AD.

³ For the most recent version of a guidance, check the FDA guidance web page at <https://www.fda.gov/regulatory-information/search-fda-guidance-documents>.

Contains Nonbinding Recommendations*Draft — Not for Implementation***II. BACKGROUND**

Historically, clinical criteria that defined later stages of AD, after the onset of overt dementia, were used for enrollment in clinical trials. Accordingly, subjects included in these trials exhibited both the cognitive changes typical of clinically evident AD and the degree of functional impairment associated with overt dementia. Drugs that were approved for dementia during that time were evaluated in that context.

As the scientific understanding of AD has evolved, efforts have been made to incorporate in clinical trials the use of biomarkers reflecting underlying AD pathophysiological changes and the enrollment of subjects with AD at earlier stages of the disease, in which there may be minimal or no detectable abnormality on clinical assessments. These efforts are particularly important because there may be an opportunity to intervene very early in the disease process of AD, given the slowly progressive course of AD and the development of characteristic pathophysiological changes that greatly precede the development of clinically evident findings. Delaying or, preferably, halting or reversing the pathophysiological process that will lead to the initial clinical deficits of AD is the ultimate goal of presymptomatic or very early symptomatic intervention, and treatment directed at this goal must begin before there are overt clinical symptoms. This opportunity carries with it the need to understand ways to assess treatment benefit in these earlier stages of disease.

This document provides an overview on the Agency's current thinking on diagnostic criteria and clinical staging of AD to inform enrollment in clinical trials and the selection of appropriate endpoints for the stage(s) of disease proposed to be enrolled in a clinical trial. The design of clinical trials that are specifically focused on the treatment of patients with AD who have developed overt dementia (i.e., Stages 4 through 6; discussed in section III), or any of the autosomal dominant forms of AD, is not discussed, although some of the principles in this guidance may be pertinent. This guidance does not discuss treatment of dementias other than AD.

III. DIAGNOSTIC CRITERIA FOR EARLY AD

Eligibility for enrollment in trials intended to support an application for approval for treatment of early AD should be based on current consensus diagnostic criteria intended to establish the true biological presence of AD rather than criteria based on syndromic or other definitions; this approach is intended to avoid enrollment of a substantial number of subjects who would not actually have AD.

FDA supports the use of biologically based diagnostic criteria that are grounded in a contemporary understanding of the pathophysiology and evolution of AD. The characteristic pathophysiological changes of AD precede, often by many years or even decades, the development of clinically evident findings and progress as a continuous disease process that can be categorized into stages. Those stages are defined below, initially only by those

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pathophysiological changes and then by the development of subtle clinical abnormalities, detectable using sensitive neuropsychological measures. These initial clinical findings are followed by the development of more apparent cognitive abnormalities, accompanied by initially mild and then more severe or more extensive functional impairment. Based on knowledge gained from previous clinical trials and the evolving understanding of the pathophysiology of AD, there is an increased focus on evaluating drug treatments for AD in the earliest stages of the disease. Diagnostic criteria that reliably define a population with early AD, including the earliest stages characterized only by pathophysiological changes, are suited to the evaluation of drugs intended to delay or prevent the emergence of overt symptoms.

Important findings applicable to the categorization of AD along its continuum of progression include the presence of pathophysiological changes as measured by biomarkers, the presence or absence of detectable abnormalities on sensitive neuropsychological measures, and cognitive symptoms reported by patients or observers with the presence or absence of functional impairment manifested as meaningful impact on daily activities. Although FDA recognizes that variations in the selection and application of clinical characteristics and biomarkers may lead to the enrollment of subjects in clinical trials who are at slightly different stages of a progressive disease process, the following categories are conceptually useful for the design and evaluation of clinical trials in different stages of AD:

- **Stage 1: Patients with characteristic pathophysiological changes of AD but no evidence of clinical impact.** These patients are truly asymptomatic with no subjective complaint, functional impairment, or detectable abnormalities on sensitive neuropsychological measures. The characteristic pathophysiological changes are typically demonstrated by assessment of various biomarker measures.
- **Stage 2: Patients with characteristic pathophysiological changes of AD and subtle detectable abnormalities on sensitive neuropsychological measures or subjective complaints of mild cognitive symptoms but no functional impairment.** This may be considered a transitional stage in which slight cognitive symptoms first appear. The emergence of subtle functional impairment signals a transition to Stage 3.
- **Stage 3: Patients with characteristic pathophysiological changes of AD, generally more apparent detectable abnormalities on sensitive neuropsychological measures, and mild but detectable functional impairment.** The functional impairment in this stage is not severe enough to warrant a diagnosis of overt dementia. This stage roughly corresponds with the syndrome of “mild cognitive impairment”; however, it is noted that the term “mild cognitive impairment” may also encompass patients in late Stage 2 or early Stage 4.
- **Stages 4, 5, and 6: Patients with overt dementia, progressing through mild, moderate, and severe stages.** This diagnosis is made as functional impairment worsens from that seen in Stage 3. A discussion of these three disease stages is not the focus of this guidance.

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For study design, it is important to define the study population using these conceptual categories, even in the presence of a single continuous disease process, to allow and inform appropriate outcome measure selection. In descriptions of studies, sponsors should identify both the stage of AD defined for study eligibility and enrollment and the stage of AD anticipated for the majority of the enrolled study population at the time of primary outcome assessment.

As discussed above, it is expected that biomarker evidence of disease will establish the reliable diagnosis of subjects in trials of early AD. As copathology is common in AD, sponsors may consider including assessments of other copathologies in their clinical trials to inform exclusion criteria or for preplanned analyses of safety and efficacy in subgroups of the enrolled population. If biomarker evidence will be needed to adequately define the anticipated indicated population and an FDA-approved or cleared diagnostic test is not available, sponsors should engage early in development with the appropriate review division at FDA to discuss the potential need for the codevelopment of a companion diagnostic device.

IV. OUTCOME MEASURES

Both clinical outcome assessments and biomarkers⁴ should be included in clinical trials enrolling subjects with AD Stages 1-3; however, the approval pathway may differ based on the selection of the primary endpoint and its ability to measure a clinically meaningful change. Direct measures of clinical benefit or validated surrogate endpoints may support a traditional approval.⁵ Surrogate endpoints or intermediate clinical endpoints that do not directly measure clinical benefit but that are considered reasonably likely to predict clinical benefit may support an accelerated approval⁶ (see section IV. C.). Under the accelerated approval pathway, postapproval trials have been required to verify and describe clinical benefit.

A. Clinical Endpoints

Historically, studies to support approval for drugs in the overt dementia stages of AD (Stages 4 through 6) have used an approach which required the assessment of both cognitive and functional (or global) measures as co-primary endpoints. The co-primary endpoint approach was used, in part, because the cognitive assessments used in the studies were not considered inherently clinically meaningful. Conventional approaches to assessing the cognitive deficits of AD use highly sensitive formalized measures of neuropsychological performance directed at particular domains that are capable of discriminating small changes in cognitive measures that may be of uncertain clinical meaningfulness when assessed alone. This approach was typically used in the setting of a therapy intended to treat disease symptoms in later stages of AD (i.e., Stages 4 through 6) and was intended to ensure that a change on a cognitive assessment was accompanied by an observed functional benefit, and alternately, that any observed functional

⁴ For definitions of clinical outcome assessments and biomarkers, refer to the BEST (Biomarker, EndpointS, and Other Tools) Resource, available at <https://www.ncbi.nlm.nih.gov/books/NBK338448>.

⁵ For further discussion of surrogate endpoints generally, please see the guidance for industry *Expedited Programs for Serious Conditions – Drugs and Biologics* (May 2014).

⁶ Section 506(c)(1)(A) of the Federal Food, Drug, and Cosmetic Act (FD&C Act) (21 U.S.C. 356(c)(1)(A)).

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benefit could be attributed to a benefit on cognition and was not attributable to changes in other conditions. This remains a generally acceptable approach for stages of AD with detectable cognitive and functional impairments (Stages 3 and higher). Using this approach, the typical duration of a clinical trial in the symptomatic stages of AD has been 2 years or less; however, FDA recognizes that it may take longer to establish a clinically meaningful treatment effect in early AD due to the minimal or absent cognitive and functional deficits seen in those stages of the disease. Additionally, many of the assessment tools typically used to measure functional impairment in patients with later dementia stages of AD (Stages 4 through 6) would not be sensitive to detect subtle functional changes in early AD. Therefore, FDA may consider other approaches, including endpoints based on cognitive assessments or surrogate endpoints, which may allow for shorter trial durations as a basis for approval in the earliest stages of AD (i.e., Stages 1, 2, and early 3).

Cognition, in its entirety, encompassing all its constituent processes and domains, is essential for daily functioning. As previously noted, it can be challenging to interpret the clinical meaningfulness of small changes detected on sensitive neuropsychological tests; however, more marked cognitive changes may represent a change that is clearly clinically meaningful. It follows, in concept, that cognitive changes of a particular magnitude, or breadth of effects across multiple domains, or change in trajectory over time, may represent clinically meaningful change, independent of measures of functional change.

In the setting of therapy that targets underlying disease pathophysiology, changes in the long-term course of core cognitive measures of AD relative to placebo may potentially provide evidence of clinically meaningful effect with respect to the clinical progression of the disease. It would generally be expected that such effects on cognitive measures would be supported by similarly persuasive effects on the characteristic pathophysiological changes of AD.

In patients in the earliest clinical stages of AD (refer to section IV. D., Considerations for Specific Stages of Early AD), FDA will consider strong justifications that a persuasive effect, considering both magnitude of effect and statistical robustness of the findings, on cognition alone as assessed by sensitive neuropsychological tests may provide adequate support for a marketing approval. Given the array of available neuropsychological tests, a pattern of putatively beneficial effects demonstrated across multiple individual tests would increase the persuasiveness of the finding; conversely, a finding on a single test unsupported by consistent findings on other tests would be less persuasive. Whether effects on cognitive outcome measures would be capable of providing evidence of effectiveness in the absence of a meaningful change in function to support either traditional or accelerated approval would require detailed discussion with the Agency. However, in a trial with relatively short-term assessments, such as a trial for a therapy intended to treat symptoms of AD, an effect on sensitive measures of neuropsychological performance of uncertain independent clinical meaning (e.g., a word-list recall test) would generally not allow for an overall finding of efficacy in the absence of meaningful functional benefit.

Contains Nonbinding Recommendations*Draft — Not for Implementation***B. Time-to-Event Analysis**

The use of a time-to-event analysis approach (e.g., time to the occurrence of a clinically meaningful event during the progressive course of AD, such as the occurrence of some degree of meaningful impairment of cognition or daily function, perhaps represented by certain disease stage transitions) would generally be an acceptable primary efficacy measure in clinical trials in early AD. Sponsors considering such an approach should discuss their plans with FDA early in development.

C. Surrogate Endpoints

Clinical trials showing an effect on a surrogate endpoint that is determined to be “reasonably likely to predict clinical benefit” can be the basis for accelerated approval,⁷ including for drugs intended for the treatment of AD. For example, in certain circumstances, FDA has considered a reduction of the brain amyloid beta burden, as assessed by positron emission tomography, to be a surrogate endpoint that is “reasonably likely to predict clinical benefit.” That endpoint, in clinical trials that enrolled participants with Stage 3 and 4 AD, has thus been used as a basis for accelerated approval for monoclonal antibodies directed against aggregated forms of amyloid beta, with postapproval trials required to verify and describe clinical benefit.

The acceptability of a surrogate endpoint for use in a particular therapeutic development program for early AD may depend on the stage of disease, population enrolled in trials, therapeutic mechanism of action, and availability of current treatments. A surrogate endpoint that is determined to be appropriate for use in a particular therapeutic clinical development program should not be assumed to be appropriate for use with a different product or trial population. Sponsors considering the use of a biomarker as the primary measure of effect should discuss their plans with FDA early in development. In general, even if accelerated approval is considered as the initial approval pathway, clinical outcome assessments should be included in clinical trials for early AD to assess early clinical changes that may potentially provide support for any changes observed on biomarkers. Evolution of the scientific understanding of AD may also influence these considerations.

FDA strongly supports and encourages continued research in understanding the role of biomarkers in AD and stresses the potential importance of biomarkers in the successful development of effective treatments appropriate for use in the earliest stages of AD. Precompetitive structured sharing across the AD scientific community of rigorously collected standardized data is a crucial component of this research.

D. Considerations for Specific Stages of Early AD**Stage 1**

Because it is highly desirable to intervene as early as possible in AD, it follows that patients with characteristic pathophysiological changes of AD but no subjective complaint, functional impairment, or detectable abnormalities on sensitive neuropsychological measures (Stage 1 AD

⁷ Section 506(c)(1)(A) of the FD&C Act (21 U.S.C. 356(c)(1)(A)).

Contains Nonbinding Recommendations*Draft — Not for Implementation*

patients) are an important target population for enrollment in clinical trials. It can be challenging in trials of a typical duration (e.g., 2 years or less) to demonstrate a clinically meaningful benefit in these patients because there is no clinical impairment to assess at baseline and patients may have variable latency to the onset of symptoms. It is anticipated that at this stage of disease, an effect on the characteristic pathophysiological changes of AD, as demonstrated by an effect on various biomarkers, may be an appropriate measure. As with the use of neuropsychological tests, a pattern of treatment effects seen across multiple individual biomarker measures would increase the persuasiveness of the putative effect. Whether effects on biomarkers would support accelerated approval would require detailed discussion with the Agency, including a plan for subsequent confirmation of clinical benefit. However, another approach to Stage 1 patients might be to conduct a study of sufficient duration to allow the evaluation of clinical outcomes, as discussed for Stage 2 patients below. As subjects transition to Stage 2 during participation in the trial, the principles applicable to outcome assessment for Stage 2 would apply. A time-to-event analysis approach could also be considered (see section IV. B.).

Sponsors considering these issues should meet with FDA early in development to discuss the evidence that would be needed to support a marketing application. Evolution of the scientific understanding of AD may also influence these considerations.

Stage 2

In patients with Stage 2 AD, who have only subtle cognitive deficits detected on sensitive measures of neuropsychological performance and no evidence of functional impairment, it may be difficult to establish a clinically meaningful benefit on subtle cognitive deficits unless the trial has a long duration. One possible approach would be to conduct a study of sufficient duration to allow the evaluation of the clinical measures that assess cognition and function, as discussed below for Stage 3 patients. A time-to-event analysis approach could also be considered (see section IV. B.).

Alternatively, as discussed in section IV. A., FDA will consider strong justifications that a persuasive effect on cognition as measured by sensitive neuropsychological tests may provide adequate support for a marketing approval. It would generally be expected that such effects on cognitive measures would be supported by similarly persuasive effects on the characteristic pathophysiological changes of AD. Whether effects on cognitive outcome measures would, in the absence of a meaningful change in function, support either traditional or accelerated approval would require detailed discussion with the Agency.

As patients transition to Stage 3 during participation in the trial, the principles applicable to outcome assessment for Stage 3 would apply.

Sponsors considering these issues should meet with FDA early in development to discuss the evidence that would be needed to support a marketing application. Evolution of the scientific understanding of AD may also influence these considerations.

Stage 3

Contains Nonbinding Recommendations*Draft — Not for Implementation*

304 Patients with Stage 3 AD approaching the onset of overt dementia have relatively mild but
305 noticeable impairments in their daily functioning. As patients have detectable cognitive and
306 functional impairment at this stage of disease, it is important to demonstrate that a therapy
307 favorably affects the observed impairments in both cognition and daily functioning. The
308 independent assessment of daily function and cognitive effects remains an acceptable approach.
309 However, it is important to note that many of the assessment tools typically used to measure
310 functional impairment in patients with later dementia stages of AD (Stages 4 through 6) may not
311 be suitable for use in early AD patients. An integrated scale that adequately and meaningfully
312 assesses independent effects on both daily function and cognition is also acceptable as a single
313 primary efficacy outcome measure in early AD patients. FDA encourages the development of
314 novel approaches to the integrated evaluation of subtle functional impairment that arise from
315 early cognitive impairment (e.g., facility with financial transactions, adequacy of social
316 conversation).

317
318 In early Stage 3 AD (which may be difficult to distinguish from late Stage 2 AD), FDA will
319 consider strong justifications that a persuasive effect on cognition as measured by sensitive
320 neuropsychological tests may provide adequate support for a marketing approval. It would
321 generally be expected that such effects on cognitive measures would be supported by similarly
322 persuasive effects on the characteristic pathophysiological changes of AD, and positive trends on
323 functional outcome assessments. As previously described, a time-to-event analysis approach
324 could also be considered (see section IV. B.). Whether effects on cognitive outcome measures
325 would, in the absence of a meaningful change in function, support either traditional or
326 accelerated approval would require detailed discussion with the Agency.
327

EXHIBIT 27

To: Thomas G Zippilli[thomas.g.zippilli@us.hsbc.com]
From: khadem massiah[khadenmassiah2018@yahoo.com]
Sent: Tue 9/28/2021 4:19:13 PM Coordinated Universal Time
Subject: Re: EXTERNAL Re: Re: Re: HSBC

Dear sir
When you have time pleasr write to me if hsbc margin is in tendinding to give compenssion to me or not yours truly

On Monday, September 27, 2021, 10:54:22 PM GMT+3:30, Thomas G Zippilli <thomas.g.zippilli@us.hsbc.com> wrote:

Good afternoon Mr. Bozorgi.

I left you a voicemail earlier today. Please advise if there is a convenient time for us to connect.

Thank you.

-Tom

PUBLIC

From: khadem massiah <khadenmassiah2018@yahoo.com>
Sent: Monday, September 27, 2021 11:24 AM
To: Thomas G Zippilli <thomas.g.zippilli@us.hsbc.com>
Subject: EXTERNAL Re: Re: Re: HSBC

Hello thomas

I would like to bring to your attention that

Hsbc margin dept caused my wholelife saving go to drain but pls do keep in mind part o this big loss is due to forcesell by your team which could have been solve otherways can you update about my claim agaisl matgindept ate there any intention for compensation pls let me know the margin could have solve this in much bettel wsys now if you check the market daily sava shates ate nring

On Saturday, September 4, 2021, 09:04:50 AM EDT, Thomas G Zippilli <thomas.g.zippilli@us.hsbc.com> wrote:

Good morning -

As discussed yesterday during our call the following has been escalated to our compliance area for review. I also communicated to you at that time that correspondence from them would follow in response to your inquiry.

In addition, the day prior to our call, you had been contacted by a supervisor and a member of our margin department to cover the details associated with the action taken.

I encourage you to review the correspondence that will be provided to you. Should you have any additional questions at that point or require further clarification I would be happy to connect with you again to review.

Thank you.

Sent with BlackBerry Work (www.blackberry.com)

From: khadem massiah <khadenmassiah2018@yahoo.com>
Sent: Sep 4, 2021 6:49 AM



To: Thomas G Zippilli <thomas.g.zippilli@us.hsbc.com>
Subject: EXTERNAL: Re: Re: HSBC

Dear sir

I have sent emails to all of you regarding my claim and not one single person have replied to me and everyone is giving runaround for the last time who is going to pay for my 900000usd due to selling 11460 shares of cassava science where other shares were available

Your money is money mine is not your concern someone has to respond and pay my losses

O Friday, September 3, 2021, 06:15:46 PM EDT, Thomas G Zippilli <thomas.g.zippilli@us.hsbc.com> wrote:

+Konstantin Rusin

Konstantin – please assist as outlined in the thread below.

Thank you.

INTERNAL

From: khadem massiah <khademmassiah2018@yahoo.com>
Sent: Friday, September 3, 2021 5:07 PM
To: Thomas G Zippilli <thomas.g.zippilli@us.hsbc.com>
Subject: EXTERNAL: Re: HSBC

Hi

I have question can you tell me how much is monthly interest for the shares that i hold now thanks

On Friday, September 3, 2021, 01:01:38 PM EDT, Thomas G Zippilli <thomas.g.zippilli@us.hsbc.com> wrote:

Good afternoon Mr. Bozorgi – just tried you again. I wanted to follow up with you based on your request from our previous conversation.

Please give me a call when you're free.

Thank you.

INTERNAL

From: Thomas G Zippilli
Sent: Friday, September 3, 2021 11:47 AM
To: 'KHADEMMASSIAH2018@YAHOO.COM' <KHADEMMASSIAH2018@YAHOO.COM>
Cc: John X Henien <john.x.henien@us.hsbc.com>
Subject: HSBC

Good morning Mr. Bozorgi –

I had attempted to contact you by phone earlier. Could you please give me a call at 917-215-1739 at your earliest convenience.

Thank you.

Thomas G. Zippilli
SVP, Wealth Sales Manager

Brooklyn | Staten Island | Jade Center | Manhattan | Mid-Atlantic | New Jersey
Wealth & Personal Banking | HSBC Securities (USA) Inc.
6702 Bay Parkway – 2nd Fl., Brooklyn N.Y. 11204
452 Fifth Avenue – Mezzanine Level, New York N.Y. 10018

Telephone: 917-215-1739

Fax: 847-793-3640

E-mail: thomas.g.zippilli@us.hsbc.com

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Investments, Annuity and Insurance Products: Are not a deposit or other obligation of the bank or any of its affiliates; Not FDIC insured or insured by any federal government agency of the United States; Not guaranteed by the bank or any of its affiliates; and subject to investment risk, including possible loss of principal invested.

All decisions regarding the tax implications of your investment(s) should be made in consultation with your independent tax advisor.

Deposit products are offered in the U.S. by HSBC Bank USA, N.A. Member FDIC.

For clients located outside of the US – Our products and services are not specifically directed at individuals located in the European Union. Our US representatives, as well as our public website, us.hsbc.com, provide products and services governed by US laws and regulations. Our products and services, as well as their specific terms and conditions, are subject to change and may not be available in all territories or to all customers. If your product requires a contract, application, disclosure, or other document to be signed, such document(s) will be deemed executed in the US and only acted upon after you have signed them and they have been received by HSBC in the US. If you are not located in the US, the laws and regulations of your country of residence could affect the offering, negotiation, discussion, provision, and/or use of HSBC US products and services. If you are not a US resident, please read the

specific cross-border product and service disclaimers, which are available on the [Cross Border Disclosure](http://www.us.hsbc.com/crossborder) page of our public website at www.us.hsbc.com/crossborder.

INTERNAL

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EXHIBIT 28



Mr. Mohammad Bozorgi
3799 Parkland Drive
Fairfax, VA 22033-2649



RE: HSBC Securities (USA) Inc. Account Number [REDACTED]

Dear Mohammad:

HSBC Securities (USA) Inc. ("HSBC") is in receipt of several of your emails from August 31, 2021 through September 4, 2021 addressed to Financial Consultant Konstantin Rusin, Wealth Supervisor John Henien and Wealth Sales Manager Thomas Zippilli. In your emails, you allege that HSBC sold shares in your account without your consent. You further inquire why HSBC sold your shares of Cassava Sciences Inccom ("SAVA") as opposed to another security in your account. In your latest communication dated September 4, 2021 you allege that HSBC should reimburse you \$900,000 for the loss you incurred from the sale of SAVA in your account. Thank you for raising your concerns and allowing us an opportunity to respond.

A review of your account revealed that on March 20, 2020 you executed the HSBC New Account Application in order to open a brokerage account (enclosed). By signing this document, you acknowledged that you received, read, understood, and agreed to be bound by the terms contained in the HSBC Customer Agreement (the "Agreement"). In section 13 of the Agreement it states, if you are unable to settle the purchase or sale of any security because of my failure to make payment or delivery of securities in good form, I authorize you to take appropriate steps to complete or cancel the transaction to minimize your loss, and I shall reimburse you for any and all costs, losses or liabilities incurred by you, including attorneys' fees. If I owe you money in the operation of my account(s), I shall pay the debt on demand. If I fail to pay the debt after demand, you may, without notice, close any and all of my accounts and liquidate my assets in them or any other assets otherwise held by you or Pershing...". In addition, on March 2, 2021 you executed a Margin Agreement (enclosed). Specifically, in section 3 "Lien" it states, "All securities, commodities, and other property of the undersigned, which Pershing may at any time be carrying for the undersigned, or which may at any time be in Pershing's possession or under Pershing's control, shall be subject to a general lien...", "...In enforcing its lien, Pershing shall have the discretion to determine which securities and property are to be sold and which contracts are to be closed...". Section 5 "Payment of Indebtedness Upon Demand and Liability for Costs of Collection" it states that, "the undersigned shall at all times be liable for the payment upon demand of any debit balance or other obligations...".

On May 27, 2021 Financial Consultant Konstantin Rusin contacted you via email to advise you of a margin call you had on your account to which you requested an extension and promised not to do it again. In addition, because of the high volatility and continued margin calls on your account Mr. Rusin requested you meet to discuss your investment strategy. You advised you were having surgery and that when you were better you would have a video conference with him. This meeting never occurred and you continued to trade on margin on an unsolicited basis.

On the morning of August 30, 2021, Senior Premier Relationship Officer Megan Last emailed you at 9:41 am EST to inform you that you had a margin call which at the opening of the market that day was in the amount of \$85,109.13, and was due on September 3, 2021. You replied that you would take care of it. On that same day at 2:04 EST Ms. Last emailed you again informing you that she left you voicemail messages on both of your phone numbers and that your account has fallen into an exchange call (your equity in the account fell into a FINRA call range). This expedited the due date of the margin call and your immediate action was required to satisfy the current call. Again at 2:28 pm EST Ms. Last sent another email to you advising you that if liquidating orders were not entered for your account that there would be a forced sell out that day. Unfortunately, you did not respond to the messages left or the emails sent until the market had already closed which was 4:00 pm EST. Based on the information provided above related to the Agreement and Margin Agreement, HSBC had to take action and sold SAVA.

Based upon the forgoing HSBC believes that you were fully informed of the terms & conditions relating to your account, and how margin calls work. We will not be offering you remuneration related to this matter. In addition, based on the activity in your account, and your large margin balance HSBC is choosing to no longer conduct business with you. Effective immediately your account is set for liquidation transactions only and we will no longer accept any purchase transactions. We respectfully request that you take your business to another financial institution. In the meantime, we would like to remind you that you are responsible to meet any and all outstanding margin calls in your account. We hope that upon further reflection, you will understand our position in this matter. Should you have any additional questions, please contact Wealth Sales Manager Thomas Zippilli at thomas.g.zippilli@us.hsbc.com or you can contact him by telephone at (917) 215-1739.

Sincerely,

HSBC SECURITIES (USA) INC.

cc: Thomas Zippilli, Wealth Sales Manager
John Henien, Wealth Supervisor

HSBC Securities (USA) Inc.

Investment, annuities, and variable life insurance products are offered by HSBC Securities (USA) Inc. (HSI), member NYSE/FINRA/SIPC. In California, HSI conducts insurance business as HSBC Securities Insurance Services. License #: **OE67746**. HSI is an affiliate of HSBC Bank USA, N.A. Whole life, universal life, term life, and other types of insurance are offered by HSBC Insurance Agency (USA) Inc., a wholly owned subsidiary of HSBC Bank USA, N.A. Products and services may vary by state and are not available in all states. California license #: **OD36843**.

Investments, Annuity and Insurance Products: Are not a deposit or other obligation of the bank or any of its affiliates; Not FDIC insured or insured by any federal government agency; Not guaranteed by the bank or any of its affiliates; and may lose value.

All decisions regarding the tax implications of your investment(s) should be made in connection with your independent tax advisor.

EXHIBIT 29

**UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549**

Form 10-K

(Mark One)

- ☒ **ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**
For the Fiscal Year Ended December 31, 2023
or
☐ **TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**
For the transition period from _____ to _____
Commission File Number: 000-29959

Cassava Sciences, Inc.

(Exact name of registrant as specified in its charter)

Delaware

(State or other jurisdiction of
incorporation or organization)

91-1911336

(I.R.S. Employer
Identification Number)

6801 N. Capital of Texas Highway, Building 1; Suite 300, Austin, TX 78731

(512) 501-2444

(Address, including zip code, of registrant's principal executive offices and
telephone number, including area code)

Securities registered pursuant to Section 12(b) of the Act:

Title of each class	Trading Symbol(s)	Name of each exchange on which registered
Common Stock, \$0.001 par value	SAVA	NASDAQ Capital Market
Warrants, exercisable for shares of Common Stock	SAVAW	NASDAQ Capital Market

Securities registered pursuant to Section 12(g) of the Act: None

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes ☒ No ☐

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Act. Yes ☐
No ☒

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes ☒ No ☐

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files). Yes ☒ No ☐.

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, smaller reporting company, or an emerging growth company. See the definitions of “large accelerated filer,” “accelerated filer,” “smaller reporting company,” and “emerging growth company” in Rule 12b-2 of the Exchange Act. (Check one):

Large accelerated filer ☒

Accelerated filer ☐

Non-accelerated filer ☐

Smaller reporting company ☐

Emerging growth company ☐

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ☐

Indicate by check mark whether the registrant has filed a report on and attestation to its management’s assessment of the effectiveness of its internal control over financial reporting under Section 404(b) of the Sarbanes-Oxley Act (15 USC. 7262(b)) by the registered public accounting firm that prepared or issued its audit report. ☒

If securities are registered pursuant to Section 12(b) of the Act, indicate by check mark whether the financial statements of the registrant included in the filing reflect the correction of an error to previously issued financial statements. ☐

Indicate by check mark whether any of those error corrections are restatements that required a recovery analysis of incentive-based compensation received by any of the registrant’s executive officers during the relevant recovery period pursuant to §240.10D-1(b). ☐

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Act). Yes ☐ No ☒

The aggregate market value of the voting and non-voting common equity held by non-affiliates was approximately \$967 million computed by reference to the last sales price of \$24.52 as reported on the Nasdaq Capital Market, as of the last business day of the Registrant's most recently completed second fiscal quarter, June 30, 2023. The number of shares outstanding of the Registrant's common stock, par value \$0.001 per share, on February 26, 2024 was 43,225,211.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the Registrant's proxy statement for its 2024 Annual Meeting of Stockholders (the “Proxy Statement”), to be filed with the U.S. Securities and Exchange Commission, no later than 120 days after the Registrant’s fiscal year ended December 31, 2023, are incorporated by reference to Part III of this Annual Report on Form 10-K.

CASSAVA SCIENCES, INC.

FORM 10-K
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PART I**FORWARD-LOOKING STATEMENTS AND NOTICES**

This Annual Report on Form 10-K, including the portions of our definitive Proxy Statement incorporated by reference herein, contains “forward-looking statements” within the meaning of the Private Securities Reform Act of 1995. We intend that such forward-looking statements be protected by the safe harbor created thereby. All statements other than statements of present or historical facts contained in this Annual Report, including statements anticipating or otherwise relating to our future results of operations and financial position, future results of ongoing clinical trials, business strategy, plans and objectives for future operations, and anticipated events or trends, are forward-looking statements. In some cases, forward-looking statements are identified by terms such as “aim,” “anticipate,” “believe,” “could,” “drive,” “estimate,” “expect,” “forecast,” “future,” “goal,” “intend,” “may,” “objective,” “plan,” “potential,” “project,” “seek,” “should,” “strategy,” “will” and “would” or the negatives of these terms or other comparable terminology.

Examples of forward-looking statements include, but are not limited to, statements about:

- the expected safety profile or treatment benefits, if any, of simufilam for people with Alzheimer’s disease in our on-going Phase 3 studies;
- our reliance on third-party contractors to conduct all of our clinical and non-clinical trials and to make drug supply on a large-scale for our Phase 3 clinical program, or their ability to do so on-time or on-budget;
- limitations around data interpretation from results of any of the three clinical phases of our 2-year safety study of simufilam in patients with Alzheimer’s disease, as compared to clinical results from randomized controlled trials;
- the ability of clinical scales to assess cognition or health in our trials of Alzheimer’s disease;
- any significant changes we may make, or anticipate making, to the design of any of our on-going Phase 3 studies of simufilam in patients with Alzheimer’s disease;
- our ability to initiate, conduct or analyze additional clinical and non-clinical studies with our product candidates targeted at Alzheimer’s disease and other neurodegenerative diseases;
- the impact of pre-clinical findings on our ability to develop our product candidates;
- the interpretation of results from our pre-clinical or early clinical studies, such as Phase 1 and Phase 2 studies;
- our plans to further develop SavaDx, our investigational blood-based diagnostic product candidate;
- our ability or willingness to expand therapeutic indications for simufilam outside of Alzheimer’s disease;
- the safety, efficacy, or potential therapeutic benefits of our product candidates;
- our use of exploratory ‘research use only’ non-safety related biomarkers in our clinical studies;
- our ability to file for and obtain regulatory approval of our product candidates;
- our strategy and ability to establish an infrastructure to commercialize any product candidates, if approved;
- the potential future revenues of our product candidates, if approved and commercialized;
- the market acceptance of our product candidates, if approved and commercialized;
- the pricing and reimbursement of our product candidates, if approved and commercialized;
- the utility of protection, or the sufficiency, of our intellectual property;
- our potential competitors or competitive products for the treatment of Alzheimer’s disease;
- our need to raise new capital from time to time to continue our operations or to expand our operations;
- our use of multiple third-party vendors and collaborators, including a Clinical Research Organization (CRO), to conduct clinical and non-clinical studies of our lead product candidate;
- expectations regarding trade secrets, technological innovations, licensing agreements and outsourcing of certain business functions;
- our expenses or incurred costs increasing by material amounts in excess of budgeted amounts due to unexpected cost overruns, inflation, imperfect forecasting, increased scope of activities or other causes;
- fluctuations in our financial or operating results;
- our operating losses, anticipated operating and capital expenditures and legal expenses;
- expectations regarding the issuance of shares of common stock, options or other equity to employees or directors pursuant to equity compensation awards, net of employment taxes;
- expectations regarding the issuance of shares of common stock to holders of outstanding warrants that are exercised for cash;
- the development and maintenance of our internal information systems and infrastructure;
- our ability to minimize the likelihood and impact of adverse cybersecurity incidents in our information systems and infrastructure;

- our need to hire additional personnel and our ability to attract and retain such personnel;
- existing or emerging regulations and regulatory developments in the United States and other jurisdictions in which we operate;
- our plans to expand the size and scope of our operations;
- the sufficiency of our cash resources to continue to fund our operations;
- potential future agreements with third parties in connection with the commercialization of our product candidates;
- the accuracy of our estimates regarding expenses, capital requirements, and needs for additional financing;
- assumptions and estimates used for our disclosures regarding stock-based compensation;
- the expense, timing and outcome of pending or future litigation or other legal proceedings and claims, including U.S. government inquiries; and
- litigation, claims or other uncertainties that may arise from allegations made against us or our collaborators.

The forward-looking statements in this Annual Report are based on our beliefs, assumptions and expectations of our future performance, events and developments, based on currently available information and plans. Forward-looking statements involve risks and uncertainties, and our actual results and the timing of events may differ materially from those discussed in the forward-looking statements. Such forward-looking statements include, but are not limited to, those described in “Item 1A. Risk Factors”, and investors should consider such risks before investing in our Company. Accordingly, you should not place undue reliance upon any forward-looking statements.

We cannot assure you that we will realize the results or developments we expect or anticipate or, even if substantially realized, that they will affect us or our operations in the way we expect.

The forward-looking statements included in this Annual Report on Form 10-K are made only as of the date hereof. We undertake no obligation to publicly update or revise any forward-looking statement as a result of new information, future events or otherwise, except as required by law.

In addition, statements that “we believe” or similar statements reflecting our beliefs, views, and opinions on the relevant subject are based upon information available to us as of the date of this Annual Report. While we believe such information forms a reasonable basis for such statements, such information may be limited or incomplete, and our statements should not be read to indicate that we have conducted an exhaustive inquiry into, or review of, all potentially available relevant information. These statements are inherently uncertain and involve a number of assumptions and limitations, and you are cautioned not to unduly rely upon these statements.

Our research programs in neurodegeneration have historically benefited from scientific and financial support from the National Institutes of Health (NIH). The contents of this Annual Report are solely our responsibility and do not represent any views of NIH, the Department of Health and Human Services, or any other agency of the United States government, or any of our vendors, collaborators or unrelated third-parties.

All our pharmaceutical assets under development are investigational product candidates. These have not been approved for use in any medical indication by any regulatory authority in any jurisdiction and their safety, efficacy or other desirable attributes, if any, have not been established in any patient population. Consequently, none of our product candidates are approved or available for sale anywhere in the world.

Our clinical results from earlier-stage clinical trials may not be indicative of future results from later-stage or larger scale clinical trials and do not ensure regulatory approval. You should not place undue reliance on these statements or any scientific data we present or publish.

All of our earlier-stage clinical trials, i.e., all studies that are not in Phase 3 stage of development, involve a relatively small number of patients and limited data. Information and results generated from our early-stage studies do not constitute, and should not be interpreted as, evidence of safety or efficacy for simufilam in Alzheimer’s disease. Rigorous evidence for drug safety and efficacy is required for regulatory approval and is derived from one or more large, randomized, placebo-controlled Phase 3 studies. The design and limited size of our early-stage studies may introduce clinical or statistical bias or may generate results that may not fully distinguish between drug effects, if any, placebo effects and random variation. Different methods of statistical analysis on clinical data from the same study may lead to objectively different numerical results. These and other statistical and clinical features of our early-stage clinical studies add complexity or limitations to the scope of data interpretation. In addition, ‘top-line results’ is a summary of the clinical data prior to the completion of a full and final audit or quality-control of the clinical database. We generally communicate top-line results so that our stakeholders have timely access to a summary of a study’s findings prior to us receiving the final dataset. Final data may change from initial top-line data.

Unless otherwise noted, all clinical data in this Annual Report is statistically non-significant at a standard probability level of $p < 0.05$. In addition, from time to time, our scientific research may include the use of exploratory biomarkers, typically labelled ‘research use only.’ They are understood to mean non-safety-related, investigational diagnostic products that are in the research phase of development and have not been approved by any regulatory agency to be effective, sensitive, specific, accurate, predictive or linked to a specific diagnosis or indication. At present there is no sufficiently reliable evidence that any observed treatment effect on such biomarkers is reasonably likely to predict clinical benefit.

National Clinical Trial (“NCT”) is an eight-digit identification number that <http://www.ClinicalTrials.gov> assigns a clinical study when it is registered with the National Library of Medicine, which is operated by the United States government.

Item 1. *Business*

Overview

Cassava Sciences, Inc. is a clinical-stage biotechnology company based in Austin, Texas. Our mission is to detect and treat neurodegenerative diseases, such as Alzheimer’s disease. Our novel science is based on stabilizing – but not removing – a critical protein in the Alzheimer’s brain. Our lead therapeutic drug candidate, simufilam, is under clinical evaluation for the proposed treatment of Alzheimer’s disease dementia in Phase 3 clinical studies.

For over 12 years, we have combined state-of-the-art technology with new insights in neurobiology to develop novel solutions for Alzheimer’s disease and other neurodegenerative diseases. Our strategy is to leverage our unique scientific/clinical platform to develop a first-in-class program for treating neurodegenerative diseases, such as Alzheimer’s—a degenerative disease of the brain, where a patient’s cognition and health functions decline over time as the disease progresses and the patient moves from mild to moderate to, eventually, severe Alzheimer’s disease.

We currently have two biopharmaceutical assets under development:

- our lead therapeutic product candidate, called simufilam, is a novel oral treatment for Alzheimer’s disease dementia; and
- our lead investigational diagnostic product candidate, called SavaDx, is a novel way to detect the presence of Alzheimer’s disease from a small sample of blood.

Our scientific approach for the treatment of Alzheimer’s disease seeks to simultaneously suppress *both* neurodegeneration and neuroinflammation. We believe our ability to potentially improve multiple vital functions in the brain represents a new, different and crucial approach to address Alzheimer’s disease.

Our lead product candidate, simufilam, is a proprietary small molecule drug. Simufilam was discovered and designed in-house and was characterized by our academic collaborators during research activities that were conducted from approximately 2008 to date.

Simufilam targets an altered form of a protein called filamin A (FLNA) in the Alzheimer’s brain. Published studies have demonstrated that the altered form of FLNA causes neuronal dysfunction, neuronal degeneration and neuroinflammation. Specifically, we believe simufilam disrupts amyloid binding to the $\alpha 7$ nicotinic acetylcholine receptor ($\alpha 7$ nAChR), which underlies our drug’s primary mechanism of action in Alzheimer’s disease. More recent data also suggest a meaningful impact of simufilam on mTOR signaling. Because mTOR contributes to age-related cellular changes, simufilam’s suppression of mTOR overactivation, concurrent with improved insulin sensitivity, may slow certain aging processes and attenuate this pathological feature, potentially benefiting brain function and memory in Alzheimer’s disease and in aging.

We own exclusive, worldwide rights to our drug and diagnostic assets and related technologies, without royalty obligations to any third party. Our patent protection with respect to simufilam and use of simufilam for Alzheimer’s disease and other neurodegenerative diseases currently runs through 2039 and includes nine issued U.S. patents. Corresponding foreign filings have been made for each of the U.S. filings.

We are currently conducting two randomized placebo-controlled Phase 3 clinical trials of oral simufilam in patients with Alzheimer’s disease dementia. Both trials are fully enrolled. The trials have randomized a total of approximately 1,900 patients with mild to moderate Alzheimer’s disease at baseline. All efficacy data from our Phase 3 program remain blinded. There are no interim analyses on efficacy outcomes.

Our first Phase 3 study, called RETHINK-ALZ, is designed to evaluate the safety and efficacy of simufilam 100 mg tablets versus placebo over 52 weeks (NCT04994483). Top-line results of our 52-week Phase 3 study are anticipated approximately year-end 2024.

Our second Phase 3 study, called REFOCUS-ALZ, is designed to evaluate the safety and efficacy of oral simufilam 100 mg and 50 mg tablets versus placebo over 76 weeks (NCT05026177). Top-line results of our 76-week Phase 3 study are anticipated approximately mid-year 2025.

Risk is Fundamental to the Drug Development Process

We are in the business of new drug discovery and development. Our research and development activities are long, complex, costly and involve a high degree of risk. Holders of our common stock should carefully read this Annual Report in its entirety, including “Item 1A. Risk Factors”. *Because risk is fundamental to the process of drug discovery and development, you are cautioned to not invest in our publicly traded securities unless you are prepared to sustain a total loss of the money you have invested.*

About Alzheimer’s Disease

Alzheimer’s is a degenerative disease of the brain that affects cognition, function and behavior. Over time, a patient’s cognition and health functions decline as the disease takes its toll. With disease progression, patients move from mild to moderate to, eventually, severe Alzheimer’s disease. Cognitive decline becomes more pronounced, and presumably more difficult to treat, in advanced stages of the disease.

An estimated 6.7 million Americans age 65 and older were living with Alzheimer’s dementia in 2023, according to the Alzheimer’s Association. According to the same source, in 2011, the largest ever demographic generation of the American population — the baby-boom generation — started reaching age 65. By 2030, the segment of the U.S. population age 65 and older will have grown substantially, and the projected 74 million older Americans will make up over 20% of the total population. Because age is a well-known risk factor for Alzheimer’s dementia, new cases of Alzheimer’s dementia are expected to climb with the growth in the number of elderly Americans.

Our Scientific Approach is Different

Given the biopharmaceutical industry’s challenging track record in Alzheimer’s research and drug development, we believe there is an urgent need to consider innovative approaches to combat this disease.

For more than twelve years, we have developed a new and promising scientific approach for the treatment and diagnosis of neurodegenerative diseases, such as Alzheimer’s disease. Importantly, we do not seek to clear amyloid out of the brain. Rather, our novel science is based on stabilizing – but not removing – a critical protein in the brain.

Our scientific approach is to treat neurodegeneration by targeting an altered form of a scaffold protein called FLNA. Through years of basic research, we and our academic collaborators identified FLNA as a structurally altered protein that enables neurodegeneration and neuroinflammation pathways in the Alzheimer’s brain. We have shown that the altered form of FLNA is pervasive in the Alzheimer’s brain and essentially undetectable in healthy control brains.

Using scientific insight and lab techniques, we believe we have elucidated this protein dysfunction. Through this work, we have produced experimental evidence that altered FLNA plays a critical role in Alzheimer’s disease. We engineered a family of high-affinity, small molecules to target this structurally altered protein and restore its normal shape and function. This family of small molecules, including our lead therapeutic product candidate, simufilam, was designed in-house and characterized by our academic collaborators.

Our lead drug candidate, simufilam, is a small molecule (oral) drug with a novel mechanism of action. The target of simufilam is altered FLNA, the structurally altered protein in the brain that we seek to stabilize. Importantly, since simufilam has a unique mechanism of action, we believe its potential therapeutic effects may be additive or synergistic with existing drug treatments for Alzheimer’s disease dementia.

Our science is based on stabilizing a critical protein in the brain

Proteins are essential for cell function because they participate in virtually every biological process. If protein function is impaired, the health consequences can be devastating. Technological advances in medicine and improvements in lifestyle are making our lives longer. But with age, genetic mutations and other factors conspire against healthy cells, resulting in altered proteins. Sometimes a cell can rid itself of altered proteins. However, when disease changes the shape and function of critical proteins, multiple downstream processes are impaired. There are many clinical conditions in which proteins become structurally altered and impair the normal function of cells, tissues and organs, leading to disease. Conversely, restoring altered proteins back to health –called proteostasis – is a well-accepted therapeutic strategy in clinical medicine.

For over 100 years, scientists have ascribed various neurodegenerative diseases to proteins that misfold and are rendered pathological. In Alzheimer's disease, certain proteins, such as amyloid and tau, lose their normal shape and function. Such misfolded proteins can break down or aggregate in clumps and form plaque or tangles in the brain. Destruction of neuronal synapses, accelerated death of neurons, and dysfunction of the brain support cells, are all widely believed to be direct consequences of misfolded proteins.

FLNA is a scaffolding protein found in high levels in the brain. A healthy scaffolding protein brings multiple proteins together, coordinating their interaction. However, an altered form of FLNA protein is found in the Alzheimer's brain. Our experimental evidence shows that altered FLNA protein contributes to Alzheimer's disease by disrupting the normal function of neurons, leading to neurodegeneration and brain inflammation. Our product candidate, simufilam, aims to counter the altered and toxic form of FLNA in the brain, thus restoring the normal function of this critical protein.

One drug, multiple effects

Simufilam binds to altered FLNA with very high (femtomolar) affinity. We believe simufilam improves brain health by reverting altered FLNA back to its native, healthy conformation, thus countering downstream toxic effects of altered FLNA. This drug effect restores the normal function of key brain receptors, including: the alpha-7 nicotinic acetylcholine receptor; the N-methyl-D-aspartate (NMDA) receptor; and the insulin receptor. These receptors have pivotal roles in brain cell survival, cognition and memory. In addition, recent data suggest a beneficial impact of simufilam on mTOR signaling.

We have generated and published experimental evidence of improved brain health by restoring altered FLNA with simufilam. In animal models, treatment with simufilam resulted in dramatic improvements in brain health, such as reduced amyloid and tau deposits, improved receptor signaling and improved learning and memory. In addition, simufilam has another beneficial treatment effect of significantly reducing inflammatory cytokines in the brain. In animal models of disease, treatment with simufilam greatly reduced levels of IL-6 and suppressed TNF-alpha and IL-1beta levels by 86% and 80%, respectively, illustrating a powerful anti-neuroinflammatory effect.

By restoring function to multiple receptors and exerting powerful anti-inflammatory effects, we believe our approach has potential to slow the progression of Alzheimer's disease in patients. We also believe our scientific approach may broaden the range of possible treatment approaches for this complex disease.

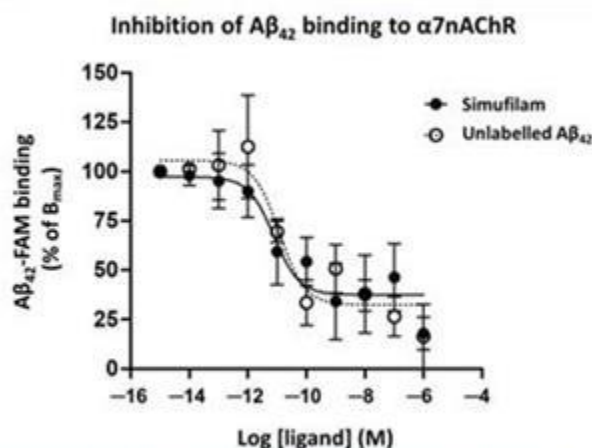
Our science is published in multiple peer-reviewed journals. In addition, our research has been supported by NIH under multiple research grant awards. Each grant was awarded following an in-depth, peer-reviewed evaluation of our approach for scientific and technical merit by a panel of outside experts in the field.

Publication Confirming Mechanism of Action of Simufilam

In September 2023, we announced the publication of new research that confirms the biological activity of simufilam. Researchers at the Cochin Institute (Paris, France) used a highly precise cell-based assay based on TR-FRET to show that simufilam interrupts amyloid binding to the $\alpha 7$ nicotinic acetylcholine receptor ($\alpha 7$ nAChR). We believe disruption of amyloid binding to $\alpha 7$ nAChR underlies simufilam's primary mechanism of action in Alzheimer's disease. The research paper was co-authored by Hoau-Yan Wang and Zhe Pei of the City University of New York, Erika Cecon, Julie Dam and Ralf Jockers of the Institut Cochin, and Lindsay Burns of Cassava Sciences, and appeared in a special issue of *International Journal of Molecular Sciences*, a peer-reviewed journal. See Figure 1.

Figure 1. Experiment conducted by Erika Cecon, Université Paris Cité, Institut Cochin in an assay she developed: Cecon et al 2019; *Br J Pharmacol*; 176:3475-3488. Data shown are means of pooled data from 4 separate experiments \pm SEM.

Reduced A β_{42} binding to $\alpha 7$ nAChR shown by TR-FRET



In a cell-based assay designed to test drug candidates' ability to disrupt A β_{42} binding to $\alpha 7$ nAChR, simufilam shows a 12 picomolar IC₅₀ and is 92% as effective as unlabeled A β_{42} .

Figure from Wang et al 2023; *Int J Mol Sci*, **24**:13927.

Publication Showing Simufilam Suppresses Overactive mTOR

In June 2023, we announced the publication of new research that showed the effects of simufilam on the mechanistic Target of Rapamycin (mTOR). Scientific literature shows overactive mTOR plays a key role in aging, Alzheimer's disease and other conditions. When functioning normally, mTOR monitors cellular needs and is activated by insulin. The new published research shows mTOR is overactive in lymphocytes isolated from blood collected from Alzheimer's patients versus healthy controls. After oral administration of simufilam 100 mg twice daily to Alzheimer's patients for 28 days, lymphocytes showed normalized mTOR activity and restored sensitivity to insulin.

These data suggest a meaningful impact of simufilam on mTOR signaling. The suppression of overactive mTOR signaling and its improved responsiveness to insulin represents a mechanistic benefit of simufilam beyond the disruption of pathogenic signaling pathways of soluble amyloid. These improvements in mTOR signaling may also result from reversing an altered conformation of FLNA, allowing FLNA to dissociate from the insulin receptor when insulin binds and initiates signaling. Because mTOR contributes to age-related cellular changes, simufilam's suppression of mTOR overactivation, concurrent with improved insulin sensitivity, may slow certain aging processes and attenuate this pathological feature of Alzheimer's disease, potentially benefiting brain function and memory in Alzheimer's disease and in aging. This mTOR research paper was co-authored by Hoau-Yan Wang, Zhe Pei and Kuo-Chieh Lee of the City University of New York, Boris Nikolov, Tamara Doehner and John Puente, who are investigators in the clinical trial protocols, and Lindsay Burns of Cassava Sciences, and appeared in *Frontiers in Aging*, a peer-reviewed journal.

Simufilam Drug Development

IND submission to FDA, Drug Safety in Early Clinical Studies

For over a decade, we conducted basic research, in vitro studies and preclinical studies in support of a successful Investigational New Drug (IND) submission to FDA for simufilam, including requisite studies around safety pharmacology, toxicology, genotoxicity and bioanalytical methods. In 2017 we filed an IND with FDA for simufilam.

Following FDA acceptance of our IND in 2017, we investigated the safety, dosing and pharmacokinetic profile of simufilam in healthy human volunteers. The design of our first-in-human Phase 1 study was based on regulatory feedback, clinical and scientific rationale and observations from previously conducted preclinical and in vitro studies. In a Phase 1 study, simufilam was evaluated in 24 healthy human volunteers (18 simufilam, 6 placebo) in a single site in the U.S. for safety, tolerability and pharmacokinetics. Study subjects were administered a single oral dose of 50, 100 or 200 mg of simufilam or placebo. Drug appeared safe and well-tolerated. Importantly, simufilam showed no treatment-related adverse effects and no dose-limiting safety findings. Pharmacokinetic measurements demonstrated that simufilam, a small molecule, was rapidly absorbed. Dose-proportionality was observed over the full dose range of 50 to 200 mg.

Phase 2 Clinical Studies

In 2019, we completed a first-in-patient, clinical-proof-of-concept, open-label Phase 2a study of simufilam in the U.S., with substantial support from the National Institute on Aging (NIA), a division of the NIH. In this small study of thirteen patients with mild-to-moderate Alzheimer's disease, treatment with simufilam for 28 days significantly improved certain exploratory biomarkers of Alzheimer's pathology, neurodegeneration and neuroinflammation ($p < 0.001$). Drug was safe and well-tolerated. Biomarkers effects were seen in all patients in both cerebrospinal fluid (CSF) and plasma.

In September 2020, we reported final results of a Phase 2b study with simufilam in Alzheimer's disease. In this clinical study funded by the NIH, Alzheimer's patients treated with 50 mg or 100 mg of simufilam twice-daily for 28 days showed statistically significant ($p < 0.05$) improvements in CSF biomarkers of disease pathology, neurodegeneration and neuroinflammation, versus Alzheimer's patients who took placebo. Simufilam treatment also significantly reduced levels of plasma P-tau181 in sample testing conducted by Quanterix Corporation, a third-party vendor. In addition, Alzheimer's patients treated with simufilam showed improvements in validated tests of episodic memory and spatial working memory, versus patients on placebo. Cognitive improvements correlated most strongly with decreases in levels of P-tau181. Drug was safe and well-tolerated.

Given the absence of observable dose-limiting effects in our Phase 1 or Phase 2 studies, and in light of the strong scientific rationale and multiple peer-reviewed publications and research grant awards, we determined that simufilam demonstrated favorable proof-of-principle for further evaluation as an investigational drug for the treatment of Alzheimer's disease.

24-Month Clinical Safety Study

Much of the strategic value of our 24 month clinical safety study is to support simufilam's long-term safety profile in patients. We believe a well-designed, long-term, safety study is a prudent risk-management undertaking. Clinical results may serve to help inform and manage the inherent risks and uncertainties of drug development while we undertake a large, expensive Phase 3 clinical testing program.

In March 2020, we initiated a clinical safety study of simufilam, our lead drug candidate, in patients with Alzheimer's disease (NCT04388254). This study was funded in part by a research grant award from NIH. This study was designed to evaluate the long-term clinical safety and tolerability of simufilam in patients with Alzheimer's disease over 24 months. The study included a pre-specified exploratory efficacy endpoint of mean change in ADAS-Cog11 scores, a cognitive scale widely used in Alzheimer's clinical research. This study enrolled over 200 patients with mild-to-moderate Alzheimer's disease ((Mini-Mental State Examination (MMSE) 16-26) who were recruited from 16 U.S. clinical sites. Alzheimer's is a progressive disease, with severity of disease typically assessed by MMSE score. In this study, mild patients are MMSE 21-26, and moderate patients are MMSE 16-20.

We conducted the 24-month safety study in three continuous phases:

- a 12-month, open-label treatment phase, followed by
- a 6-month randomized, placebo-controlled withdrawal phase (previously referred to as the "Cognition Maintenance Study" or CMS), followed by
- 6 additional months of open-label treatment.

Study participants received simufilam oral tablets 100 mg twice-daily in the open-label treatment phases, and simufilam or matching placebo during the randomized withdrawal phase. In an open-label study design, both the health providers and the patients are aware of the drug treatment being given.

All study participants who completed 12 months of open-label simufilam treatment were eligible to participate in the 6-month randomized, placebo-controlled withdrawal phase. Likewise, all study participants who completed the randomized, placebo-controlled withdrawal phase were eligible for 6 additional months of open-label treatment.

Study Results for the 12-month, Open-label Treatment Phase

In January 2023, we announced positive top-line results for the 12-month, open-label treatment phase of the safety study. The pre-specified, exploratory efficacy endpoint was change in baseline on ADAS-Cog11, a cognitive scale widely used in Alzheimer's clinical research. Other exploratory endpoints included the Mini-Mental State Examination (MMSE) to assess disease stage by cognitive impairment; the Neuropsychiatric Inventory (NPI) to assess dementia related behavior; and the Geriatric Depression Scale (GDS). Endpoints were measured at baseline (study entry) and month 12.

Top-line Results – mean scores, baseline to month 12 (lower is better, except for MMSE):

- ADAS-Cog11 scores changed from 19.1 (± 9.2) to 19.6 (± 13.3)
- MMSE scores changed from 21.5 (± 3.6) to 20.2 (± 6.4)
- NPI10 scores changed from 3.2 (± 4.6) to 2.9 (± 4.6)
- GDS scores changed from 1.8 (± 1.8) to 1.4 (± 1.9)

Response Analysis – baseline to month 12

- ADAS-Cog scores improved in 47% of patients; this group had a mean change of -4.7 (± 3.8) points (lower is better).
- In an additional 23% of patients, ADAS-Cog declined less than 5 points; this group had a mean change of 2.5 (± 1.4) points.
- Patients with an NPI10 score of zero increased from 42% to 54%, indicating reduced dementia-related neuropsychiatric symptoms after 1 year on simufilam.

The Full Analysis Set (FAS) population (N=216) was used for the statistical analysis of efficacy endpoints. Mild and moderate sub-groups showed notable differences on changes in ADAS-Cog mean scores, baseline to month 12 (lower is better):

- In the *mild* sub-group (MMSE 21-26), mean ADAS-Cog scores improved, from 15.0 (± 6.3) to 12.6 (± 7.8)
- In the *moderate* sub-group (MMSE 16-20), mean ADAS-Cog scores worsened, from 25.7 (± 9.2) to 30.1 (± 13.1)

We believe the improvement in ADAS-Cog over 1 year in mild patients taking simufilam is well outside the expected range of historic placebo decline rates from numerous other studies. Figure 2: historical declines on ADAS-Cog in early disease (MCI + mild) and mild disease.

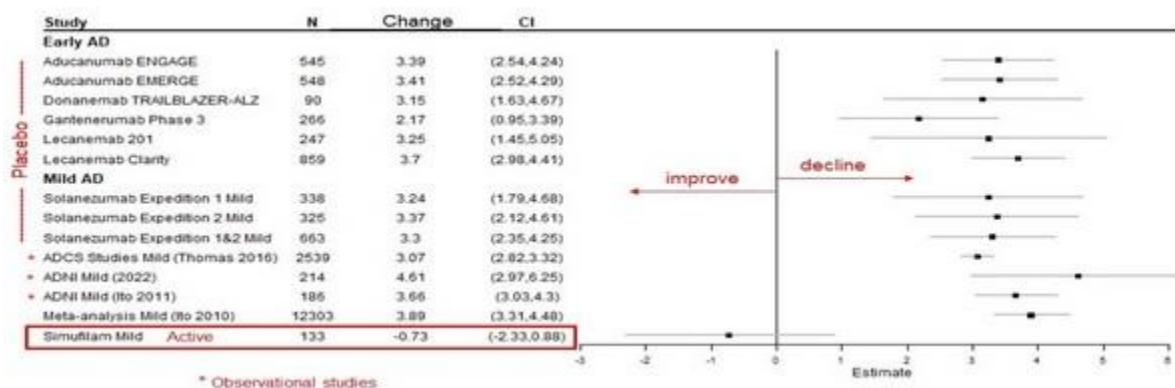


Figure 1: Statistical model of simufilam versus historical 1-year placebo declines on ADAS-Cog in early disease and mild disease. Forest plot by Pentara Corporation, independent biostatisticians. Data was sourced from non-randomized studies (i.e., ADNI) and randomized, controlled trials conducted by other sponsors in patients with early (i.e., MCI + mild) and mild Alzheimer's disease.

Safety Data - Simufilam 100 mg tablets twice daily appeared safe and well tolerated in this treatment phase of the open-label study. There were no drug-related serious adverse events. Three treatment-emergent adverse events (TEAEs) occurred in 7% or more of study patients: COVID-19 (12%), urinary tract infection (10%) and headache (9%). Reported TEAEs are based on all study patients who received at least one dose of drug.

Biomarker Data - In this open-label treatment phase of the study, exploratory biomarkers were analyzed from CSF collected from 25 patients who agreed to undergo a lumbar puncture at baseline and again after 6 months of treatment. CSF samples were analyzed blind to timepoint by our academic collaborator at City University of New York.

P-values shown below are baseline vs. 6-month levels by paired t-test:

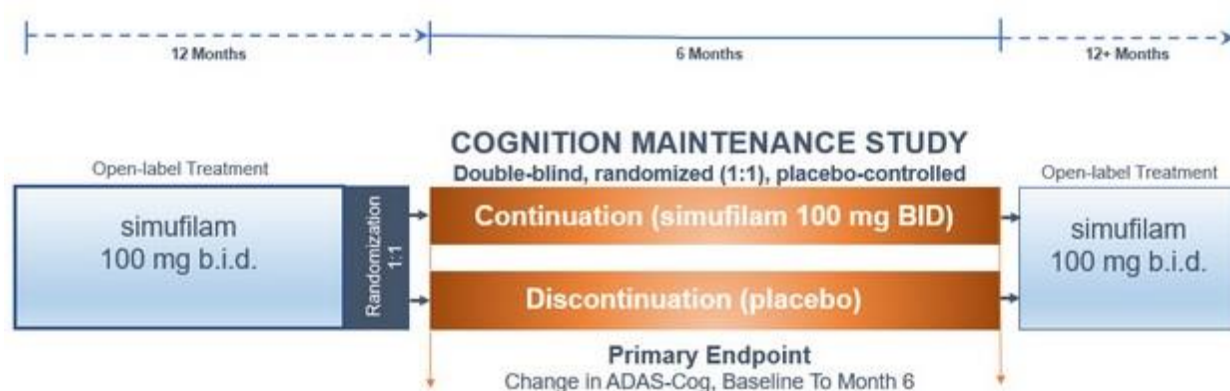
- CSF biomarkers of disease pathology, t-tau and p-tau181, decreased 38% and 18%, respectively (both $p < 0.00001$)
- CSF biomarkers of neurodegeneration, neurogranin and neurofilament light chain (NfL), decreased 72% and 55%, respectively (both $p < 0.00001$)
- CSF biomarkers of neuroinflammation, sTREM2 and YKL-40, decreased 65% and 44% (both $p < 0.00001$)

Study Results for the 6-month, Randomized Withdrawal Study Phase ("Cognition Maintenance Study")

In May 2021, we initiated the randomized, withdrawal phase of the 24 month safety study, which has been previously referred to as the 'Cognition Maintenance Study' or CMS. The CMS has a randomized, withdrawal study design. The International Council for Harmonization of Technical Requirements for Pharmaceuticals for Human Use (ICH) explains that in a randomized withdrawal study, "subjects receiving a test treatment for a specified time are randomly assigned to continued treatment with the test treatment or to placebo (i.e., withdrawal of active therapy) ... Any difference that emerges between the group receiving continued treatment and the group randomized to placebo would demonstrate the effect of the active treatment."

The design of randomized, withdrawal phase of the study was intended to evaluate simufilam's effects on cognition and health outcomes in Alzheimer's patients who continue with drug treatment versus patients who discontinue drug treatment. This was a double-blind, randomized, placebo-controlled study of simufilam in patients with mild-to-moderate Alzheimer's disease. Study patients were randomized (1:1) to simufilam or placebo for six months. To enroll in the CMS, patients must have previously completed 12 months or more of open-label treatment with simufilam. Final enrollment was 157 patients. See Figure 3.

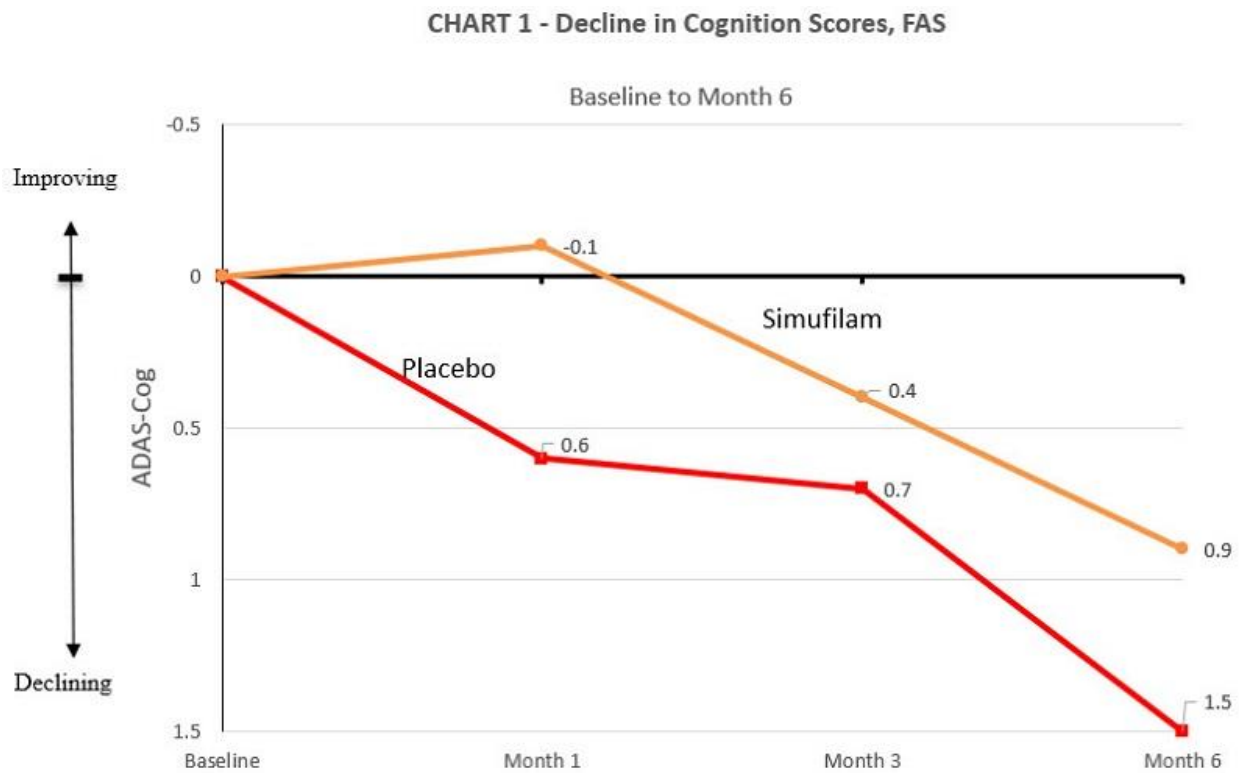
Figure 3. Design of the Randomized Withdrawal Phase (CMS)



Top-line Results - Simufilam treatment for 6 months slowed cognitive decline by 38% compared to placebo in mild-to-moderate Alzheimer's disease (MMSE 16-26) patients. The placebo arm declined 1.5 points on ADAS-Cog, and this arm declined at all measured timepoints. The simufilam arm declined 0.9 points on ADAS-Cog, a 38% difference in favor of drug at month 6 (95% CI, - 2.1 to 1.0; not significant for sample sizes). See Table 1 and Chart 1.

Table 1: Results of Randomized Withdrawal Study – cognitive change, full analysis set (FAS)

Full Analysis Set	Simufilam 100 mg (N = 78)	Placebo (N = 77)	Numerical Difference	Percent Difference
6-month Change in ADAS-Cog	0.9 point Decline	1.5 point Decline	-0.6	38% in favor of drug

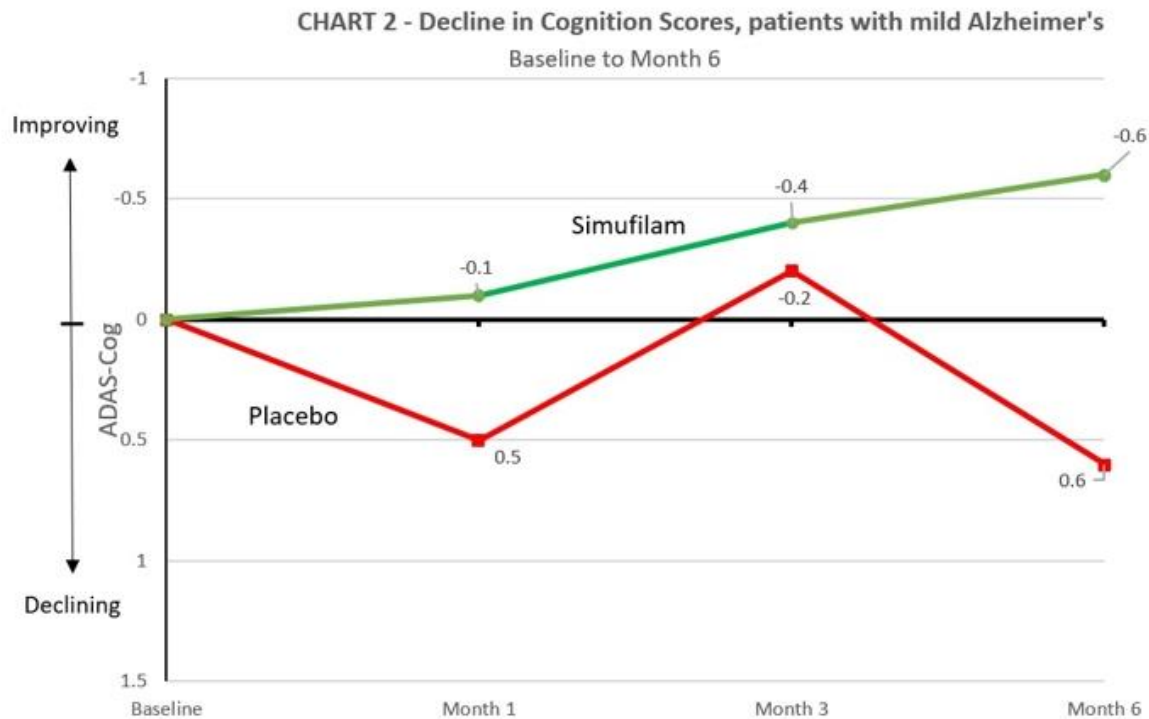


Upon randomization into the randomized, withdrawal phase, mean baseline MMSE scores were 18.6 and 18.1 for the simufilam and placebo arms, respectively. Mean baseline ADAS-Cog scores were 19.3 and 21.9 for the simufilam and placebo arms, respectively.

Simufilam Drug Effects Favored Patients with Mild Alzheimer's Disease – Simufilam treatment for 6 months slowed cognitive decline > 200% compared to placebo in mild Alzheimer's disease. Patients with mild Alzheimer's (MMSE 21-26) on placebo declined 0.6 points on ADAS-Cog over 6 months as a group. Patients with mild Alzheimer's on simufilam improved 0.6 points over 6 months as a group, a 205% difference in favor of drug (95% CI, -2.6 to 0.4; not significant for sample sizes). See Table 2 and Chart 2.

Table 2: Results of Randomized Withdrawal Study – cognitive change, mild patients

<i>Mild Patients</i>	Simufilam 100 mg (N= 40)	Placebo (N= 36)	Numerical Difference	Percent Difference
6-month Changes in ADAS-Cog	0.6 point Improvement	0.6 point Decline	-1.1	205% in favor of drug



Upon randomization into the randomized, withdrawal phase of the study, mean baseline MMSE scores for mild patients were MMSE 24.0 and MMSE 24.1 for the simufilam and placebo arms, respectively. Mean baseline ADAS-Cog scores for mild patients were 11.0 and 11.2 for the simufilam and placebo arms, respectively.

Simufilam for 18 months stabilized cognition in mild Alzheimer's disease – After taking open-label simufilam for 12 months, 76 patients with mild Alzheimer's disease (MMSE 21-26) enrolled in the randomized, withdrawal phase and were randomized to receive either simufilam (N=40) or placebo (N=36) for 6 months. Mild patients randomized to simufilam in the CMS showed no material decline in ADAS-Cog scores over 18 months as a group, indicating stable cognition. Mild patients randomized to placebo in the randomized, withdrawal phase (and therefore withdrawn from simufilam treatment for 6 months) declined by 0.8 points in ADAS-Cog over 18 months as a group. See Figure 4.

Figure 4. Historical declines on ADAS-Cog over 18 months in Alzheimer's disease (MMSE 20-30), placebo arms vs simufilam treatment.

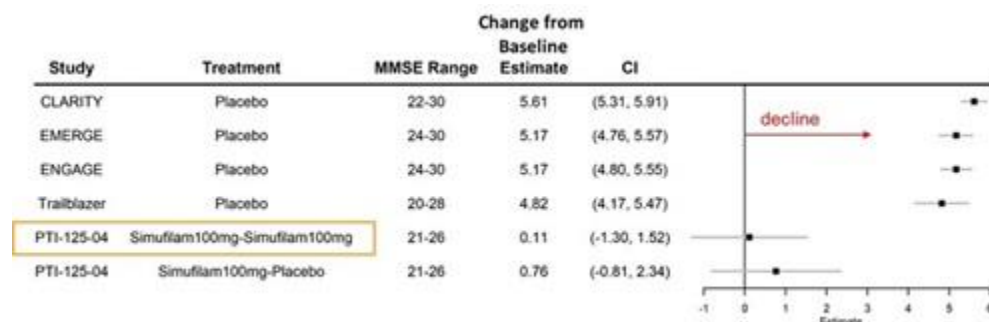


Figure 4: Forest plot by Pentara Corporation, independent biostatisticians. Data was sourced from the placebo groups in randomized, controlled trials of monoclonal antibodies conducted by other sponsors in Alzheimer's disease (MMSE 20-30). Results shown for CLARITY P3 trial of lecanemab; EMERGE and ENGAGE P3 studies of aducanumab; and TRAILBLAZER P3 trial of donanemab; in this figure, the randomized, withdrawal phase is referred to as the 'PTI-125-04' study; 'Simufilam100mg-Simufilam100mg' refers to patients who received simufilam in both the open-label phase and the randomized, withdrawal phase; 'Simufilam100mg-Placebo' refers to patients who received simufilam in the open-label phase and placebo in the randomized, withdrawal phase.

Safety Data – Simufilam 100 mg tablets twice daily appeared safe and well tolerated in the 6-month the randomized, withdrawal phase of the 24 month safety study.

Discussion –Patients who completed 12 months of open-label simufilam treatment were invited to participate in the randomized, withdrawal phase. It is not known how long a washout period may be needed to remove lingering drug effects, if any, from prior treatment with open-label simufilam for 12 months. In this small randomized, withdrawal study phase in patients with mild-to-moderate Alzheimer’s disease, simufilam slowed cognitive decline by 38% on ADAS-Cog over six months (not statistically significant), with good drug safety. Effects were pronounced in mild patients. Mean baseline MMSE and ADAS-Cog scores were approximately balanced given the small size of each arm.

Study Results for the 24-Month Safety Study

In February 2024, we reported top-line results of the 24-month clinical safety study. Average changes in ADAS-Cog scores, baseline to month 24, indicate the following:

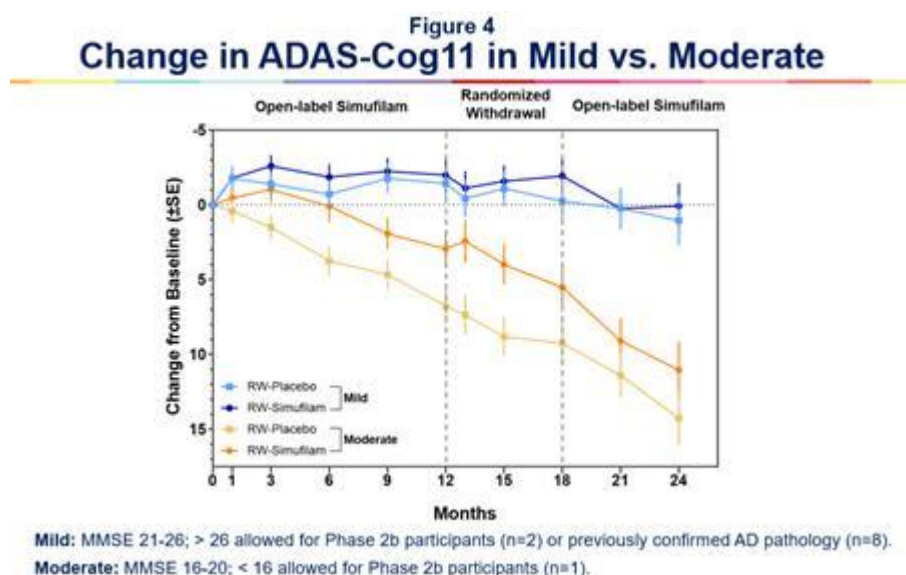
- Patients with mild Alzheimer’s disease who received simufilam treatment continuously for two years (n=47) had no decline in ADAS-Cog scores (± 1.51 SE) as a group.
- Patients with mild Alzheimer’s who received simufilam treatment non-continuously (n=40) declined 1 point on ADAS-Cog (± 1.65 SE) as a group. Non-continuous treatment consisted of one year on open-label drug, six months on placebo and six months back on open-label drug.
- In patients with mild Alzheimer’s, the largest separation between the continuous and non-continuous treatment groups occurred at the end of the 6-month randomized, placebo-controlled withdrawal phase.
- Patients with moderate Alzheimer’s who received simufilam treatment continuously for two years (n=32) declined 11.05 points on ADAS-Cog (± 1.91 SE) as a group.

Patients with mild Alzheimer’s disease (n=87) started the 24 months study with MMSE 21-26, with ten exceptions. Patients with moderate Alzheimer’s started the 24 months study with MMSE 16-20, with one patient who entered with MMSE 15.

The pre-specified cognition endpoints were analyzed on the Full Analysis Set (FAS) by an independent consulting firm that specializes in complex statistical analysis of clinical trial results. The FAS population consists of all study participants who received at least one dose of treatment and have both baseline and at least one post-baseline assessment. (Because FAS data is specific to each phase of a study, the FAS for the 24-month study may differ from the FAS for other study phases).

Mild patients who received simufilam for 24 continuous months (n=47) showed an average change of 0.07 points on ADAS-Cog11 (± 1.51 SE), baseline to month 24, as a group.

Mild Alzheimer’s patients who received 12 months of open-label simufilam, followed by placebo in the 6-month randomized, placebo-controlled withdrawal phase, followed by an additional 6 months of open-label simufilam (n=40), declined by an average of 1.04 points on ADAS-Cog11 (± 1.65 SE), baseline to month 24, as a group. See Figure 4B.



Mean ADAS-Cog scores at baseline were approximately balanced in the group of mild Alzheimer's patients who received drug continuously versus non-continuously (15.2 and 14.6, respectively).

Safety Data – Oral simufilam 100 mg tablets twice daily appeared safe and well tolerated in this study. There were no drug-related serious adverse events. The most common treatment-emergent adverse events (TEAEs) were Covid-19 and urinary tract infection.

End-of-Phase 2 (EOP2) Meeting with FDA

In January 2021, we held an End-of-phase 2 (EOP2) meeting for simufilam with the U.S. Food and Drug Administration (FDA). The purpose of this EOP2 meeting was to gain general agreement around key elements of a pivotal Phase 3 program to treat Alzheimer's disease dementia. FDA attendees included Robert Temple, MD, Deputy Center Director for Clinical Science and Senior Advisor in the Office of New Drugs; Billy Dunn, MD, Director, Office of Neuroscience; Eric Bastings, MD, Director, Division of Neurology, and others.

In February 2021, we announced the successful completion of our EOP2 meeting. Official meeting minutes confirm that we and FDA are aligned on key elements of a Phase 3 clinical program for simufilam. FDA agreed that the completed Phase 2 program, together with an ongoing and well-defined Phase 3 clinical program, are sufficient to potentially show evidence of clinical efficacy for simufilam in Alzheimer's disease. There was also agreement that the use of separate clinical scales to assess cognition (ADAS-cog¹) and function (ADCS-ADL²) are appropriate endpoints of efficacy. iADRS³ is an efficacy endpoint that combines scores for ADAS-cog and ADCS-ADL, and thereby provide a single composite measure of cognition and health function. Other endpoints include the NPI⁴.

¹ ADAS-Cog = *The Alzheimer's Disease Assessment Scale – Cognitive Subscale, a measure of cognition*

² ADCS-ADL = *Alzheimer's Disease Cooperative Study – Activities of Daily Living, a measure of health function*

³iADRS = *integrated Alzheimer's Disease Rating Scale, a composite measure of cognition and health function*

⁴NPI = *Neuropsychiatric Inventory, a clinical tool that assesses the presence and severity of dementia-related behavior*

Special Protocol Assessments

In August 2021, we announced we had reached agreement with FDA under a Special Protocol Assessment (SPA) for both Phase 3 studies. These SPA agreements document that FDA has reviewed and agreed upon the key design features of our Phase 3 study protocols of simufilam for the treatment of patients with Alzheimer's disease.

An SPA agreement indicates concurrence by the FDA with the adequacy and acceptability of specific critical elements of overall protocol design (e.g., entry criteria, dose selection, endpoints, etc.). These elements are critical to ensure that our planned Phase 3 studies of simufilam in Alzheimer's disease can potentially be considered adequate and well-controlled studies in support of a future regulatory submission and marketing application.

The first clinical study protocol under the SPA is titled "*A Phase 3, Randomized, Double-Blind, Placebo-Controlled, Parallel-Group, 52-Week Study Evaluating the Safety and Efficacy of One Dose of Simufilam in Subjects with Mild-to-Moderate Alzheimer's Disease.*"

The second clinical study protocol under the SPA is titled "*A Phase 3, Randomized, Double-Blind, Placebo-Controlled, Parallel-Group, 76-Week Study Evaluating the Safety and Efficacy of Two Doses of Simufilam in Subjects with Mild-to-Moderate Alzheimer's Disease.*"

Phase 3 Clinical Program Overview

Our Phase 3 program consists of two large, double-blind, randomized, placebo-controlled studies of simufilam in patients with mild-to-moderate Alzheimer's disease dementia. Both studies are designed to measure changes in cognition and function during their treatment period. Some highlights of this clinical program are summarized in Figure 5.

Premier Research International is the CRO supporting the conduct of our Phase 3 clinical program. Our Phase 3 clinical sites are currently located in the United States, Canada, Puerto Rico, Australia, and South Korea.

Figure 5. Summary of Our Phase 3 Clinical Program**RETHINK-ALZ and REFOCUS-ALZ**

In Fall 2021, we announced initiation of two Phase 3 studies of simufilam in mild-to-moderate Alzheimer's disease dementia. In November 2023, we had announced the completion of patient enrollment in both Phase 3 studies. A total of approximately 1,900 patients are randomized into these studies. Approximately 70% of randomized patients entered our Phase 3 studies with mild Alzheimer's disease (MMSE 20 to 27).

The first Phase 3 study, called RETHINK-ALZ, is designed to evaluate the safety and efficacy of oral simufilam 100 mg over 52 weeks (NCT04994483). Details of the RETHINK-ALZ Phase 3 study include:

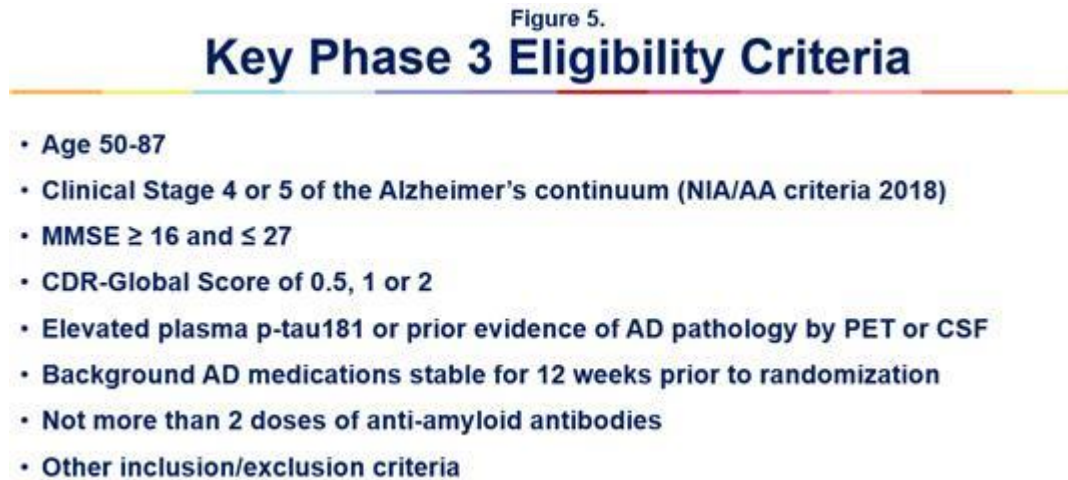
- ▶ Approximately 800 patients are randomized into this study.
- ▶ Patients are randomized (1:1) to simufilam 100 mg tablets or matching placebo twice daily.
- ▶ Patients are treated for 52 weeks.
- ▶ Efficacy endpoints are ADAS-Cog12, a cognitive scale, and ADCS-ADL, a functional scale and iADRS, (which is a combination of scores from ADAS-Cog & ADCS-ADL). All three clinical measurements are standard psychometric assessment tools in trials of Alzheimer's disease.
- ▶ Other endpoints include plasma biomarkers of disease and NPI, a clinical tool that assesses the presence and severity of dementia-related behavior.
- ▶ No interim analyses on efficacy are planned.

Our second Phase 3 study, called REFOCUS-ALZ, is designed to evaluate the safety and efficacy of oral simufilam 100 mg and 50 mg over 76 weeks (NCT05026177). Details of the REFOCUS-ALZ Phase 3 study include:

- ▶ Approximately 1,100 patients are randomized into this study.
- ▶ Patients are randomized (1:1:1) to simufilam 100 mg tablets, 50 mg tablets, or matching placebo twice daily.
- ▶ Patients are treated for 76 weeks.
- ▶ Efficacy endpoints are ADAS-Cog12, a cognitive scale, and ADCS-ADL, a functional scale and iADRS, (which is a combination of scores from ADAS-Cog & ADCS-ADL). All three clinical measurements are standard psychometric assessment tools in trials of Alzheimer's disease.
- ▶ Other endpoints include biomarkers of disease, MRI imaging and NPI, a clinical tool that assesses the presence and severity of dementia-related behavior.
- ▶ No interim analyses on efficacy are planned.

Phase 3 Entry Criteria

In our Phase 3 clinical studies, eligibility criteria are the requirements that patients must meet to be included in a study. These requirements help make sure that study participants are substantially and closely matched as a group in terms of specific factors such as age, disease or stage of disease, general health, and other key factors. Eligibility criteria can consist of inclusion criteria, which are required for a person to participate in the study, or exclusion criteria, which prevent a person from participating. See Figure 5A.



Use of Plasma Phosphorylated-tau181 (p-tau181)

We believe plasma p-tau181 is a biomarker qualifier of Alzheimer's neuropathology. RETHINK-ALZ and REFOCUS-ALZ Phase 3 studies use a 'research use only', non-safety related exploratory p-tau181 plasma assay to qualify mild-to-moderate Alzheimer's patients. The plasma assay we use does not rely on age, APOE-gene status or complex algorithms to provide a result. P-Tau181 testing was performed by an independent commercial laboratory.

Data and Safety Monitoring Board (DSMB)

In September 2023, we announced that a routine, scheduled meeting of a DSMB recommended that both of our Phase 3 studies continue as planned, without modification. This DSMB only reviewed patient safety. It did not assess drug efficacy.

Interim MRI Safety Data

In October 2023, we announced a potentially significant safety finding based on interim magnetic resonance imaging (MRI) brain data from Alzheimer's patients who are enrolled in a Phase 3 clinical trial of simufilam. These MRI data suggest simufilam is not associated with treatment-emergent amyloid-related imaging abnormalities, or ARIA. MRIs were all analyzed for ARIA by independent, board-certified neuroradiologists.

ARIA is a medical term used to describe a spectrum of brain MRI imaging abnormalities, such as brain swelling and brain bleeds. ARIA is a known risk factor for Alzheimer's patients taking the class of drugs known as monoclonal antibodies directed against amyloid. In contrast to that class of drugs, simufilam is a small-molecule (oral) drug candidate.

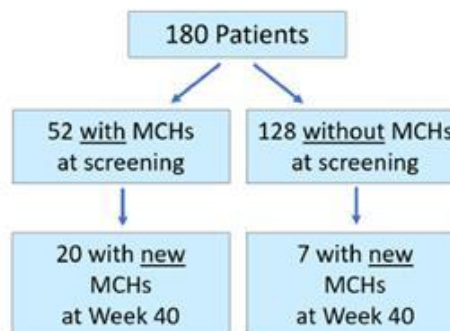
The new safety finding is based on an independent, interim neuroradiological evaluation of brain MRIs taken at week 40 in a blinded sub-study of 180 Alzheimer's patients enrolled in REFOCUS-ALZ, our on-going 76-week Phase 3 clinical trial of simufilam in mild-to-moderate Alzheimer's. Final MRI data is expected at the conclusion of this Phase 3 study. See Figure 6.

Figure 6.

Interim Phase 3 Safety Data on ARIA

Blinded Interim MRI Safety Analysis Suggests Simufilam is Not Associated with Treatment-emergent ARIA

- Week-40 MRIs were examined for 180 of 222 AD patients in a volumetric MRI sub-study.
- ARIA-E was not observed in any patient.
- ARIA-H (microhemorrhages or MCHs) was a common finding at screening (29%).
- Incidence of new ARIA-H was similar to other placebo reports.
- 85% of patients did not develop new MCHs.



Status of Phase 3 Clinical Program

Our Phase 3 trials have randomized a total of approximately 1,900 patients with mild to moderate stages of Alzheimer's disease at baseline (MMSE 16-27), with approximately 800 patients randomized in the 52-week study (RETHINK-ALZ) and approximately 1,100 patients randomized in the 76-week study (REFOCUS-ALZ).

Approximately 70% of patients enrolled in our Phase 3 trials are diagnosed with mild Alzheimer's disease (MMSE 20-27), with remaining patients entering the study with moderate disease (MMSE 16-19). Since the distribution of patients randomized in these trials is numerically skewed towards mild patients, we expect to rely predominantly on outcomes from mild patients to evaluate drug safety and efficacy.

Over 340 patients have completed the 52-week RETHINK-ALZ study. Over 215 patients have completed the 76-week REFOCUS-ALZ study, for a total of over 555 completers.

All efficacy data from our Phase 3 program remain blinded. There are no interim analyses on efficacy outcomes.

We anticipate top-line data readout for our 52-week study (RETHINK-ALZ) approximately year-end 2024.

We anticipate top-line data readout for our 76-week study (REFOCUS-ALZ) approximately mid-year 2025.

We have initiated a discussion with the FDA to finalize a statistical analysis plan (SAP), which is a formal document defining the detailed analysis that our independent biostatisticians will undertake as to efficacy data collected in our Phase 3 trials. The SAP includes in-depth technical details and descriptions on the intended clinical trial analysis, the statistical methods and models that will be used, the population being analyzed, the data variables that will be analyzed, how missing data will be accounted for, descriptions of covariates to be included in the statistical model, and other statistical factors, all of which will be prospectively defined, documented and finalized prior to unblinding of any efficacy outcomes.

Open-label Extension Study for the Phase 3 Program

In October 2022, we announced the initiation of an open-label extension study for our Phase 3 program. This study is designed to provide no-cost access to oral simufilam for up to one year to Alzheimer's patients who have successfully completed a Phase 3 study of simufilam and who meet other entry criteria.

We expect the open-label extension study to generate additional long-term clinical safety data for oral simufilam 100 mg twice daily over 52 weeks. There is no obligation for a patient or a physician to participate in the open-label extension study. Each clinical investigational site and each patient chooses whether to participate in this open-label extension study.

Patient enrollment for this study began in November 2022. To date, over 500 patients entered the open-label extension study.

Phase 3 Drug Supply

We have a drug supply agreement with Evonik Industries AG for simufilam. Under the agreement, Evonik supplies and is expected to continue to supply us with large-scale, clinical-grade quantities of simufilam. Evonik is one of the world's largest contract development and manufacturing organizations for pharmaceutical ingredients. Other vendors supply excipients, the finished dosage form (i.e., simufilam tablets), drug packaging, package labeling and other critical components of the supply chain for Phase 3 drug supply.

SavaDx

Our investigational product candidate, called SavaDx, is an early-stage program focused on detecting the presence of Alzheimer's disease from a small sample of blood. For business, technical and personnel reasons, we continue to prioritize the development of simufilam, our novel drug candidate, over SavaDx, our novel diagnostic candidate. SavaDx is a research-use only, non-safety related exploratory biomarker. Development activity related to SavaDx accounts for less than 1% of our research budget.

Working with third parties, we continue to evaluate the use of mass spectrometry to detect FLNA or other proteins of interest. The data and information generated from these evaluations continues to be under review for potential intellectual property rights.

The regulatory pathway for SavaDx may eventually include formal analytical validation studies and clinical studies that support evidence of sensitivity, specificity and other variables in various healthy and diseased patient populations. We have not conducted such studies and do not expect to conduct such studies in 2024.

SavaDx is designed as an antibody-based detection system for altered filamin A (FLNA). Working with third parties, we are evaluating the use of mass spectrometry to detect FLNA, i.e., without the use of antibodies. These evaluations are on-going.

Over the past twelve years, we discovered that altered FLNA is a hallmark feature of brain pathology in patients with Alzheimer's disease. We believe SavaDx may reveal early traces of the disease, potentially even before the overt appearance of disease symptoms, such as memory loss.

A diagnostic test usually measures one or more biomarkers, which are biological indicators of disease. A deep understanding of the biology of disease is required to identify and develop a diagnostic. A valid diagnostic has certain baseline characteristics to be functional and useful for clinical practice. It must detect disease in patients (sensitivity) and, conversely, not detect disease in healthy subjects (specificity); and it is preferably quantitative, giving some indication of severity or stage of disease. Collectively, the ability to selectively detect disease indicators can be useful to provide diagnostic information (i.e., detect the disease) or prognostic information (i.e., predict the disease or its future course).

Currently, the most definitive method to diagnose Alzheimer's disease is through autopsy after death, which is not particularly helpful. Methods to detect Alzheimer's disease during its course can be expensive, invasive, subjective, risky and/or uncomfortable. Importantly, because of the expense and invasiveness of current tests, most people are not tested until they show obvious cognitive decline.

Current approaches for diagnosing Alzheimer's disease include measurement of amyloid- β (specifically, A β 42), total tau (T-tau) or phosphorylated tau (P-tau) levels in CSF or plasma; structural neuroimaging techniques, including magnetic resonance imaging (MRI) or computerized tomography (CT); positron-emission tomography (PET) imaging of brain amyloid (AmyVid®); and batteries of cognitive tests. Usually, a combination of more than one test is necessary to provide a working diagnosis. When such tests and techniques are used together, the totality of data can be sensitive and specific for the detection of Alzheimer's disease. In practice, however, such tests and techniques are only used after overt symptoms of impaired memory.

We believe there is a profound need for a blood-based diagnostic test for Alzheimer's disease. A quick, simple, inexpensive test may benefit the medical community in many ways. Advantages may include confirming the presence of Alzheimer's disease earlier, when lifestyle changes and potential therapeutics may have the most impact, or conversely, to rule out Alzheimer's disease at such early stages. Other potential benefits include discriminating Alzheimer's disease from other causes of dementias; helping to identify stage of Alzheimer's disease; selection and enrollment of appropriate patients into clinical studies of experimental product candidates; and better alignment of a patient's specific diagnosis with a targeted therapeutic.

It is widely accepted that in Alzheimer's disease, pathological changes in the brain occur at least 10-15 years before clinical symptoms appear. These "pre-symptomatic" changes include deposits of certain misfolded or impaired proteins in the brain. Our long-term goal with SavaDx is to identify people with Alzheimer's disease, potentially long before clinical symptoms occur. Early detection may be critical for any intervention to cease – or at least slow down – brain damage before it is too late. Importantly, a non-invasive screen for latent Alzheimer's disease prior to overt symptoms could be conducted as a general health screen, not just in patients at risk by family history or in patients already showing cognitive impairment. Once a disease-modifying treatment is found, early detection is likely to be critically important. Early detection and treatment may also be critical in identifying such a disease-modifying treatment, as many believe one reason for clinical study failures in Alzheimer's disease is that treatment has routinely started too late in the course of disease to make any impact.

Moreover, with repeat measurements over time, SavaDx may provide a probability of cognitive decline or disease progression. Even if SavaDx does not provide a precise numerical cutoff value for Alzheimer's disease, we believe it may be important to incorporate data from SavaDx into the overall diagnostic framework for neurodegeneration, and Alzheimer's disease in particular. As with any diagnosis of disease, some people may embrace a way to detect Alzheimer's disease long before clinical symptoms appear, while others may prefer not to know – at least until better treatments are found.

Diagnostic development program.

Diagnostic development differs from drug development in many important ways. As a result, diagnostic development requires substantial differences in planning, study design and study execution.

Some of the ways that diagnostic development differs from drug development include the following:

- We may need to choose among a wider range of regulatory pathways for approval of SavaDx, depending on factors such as intended use and user, test type and complexity and role in patient-care decisions;
- Drug studies usually deal primarily with one office within FDA, but the regulatory pathway for SavaDx may require us to consider the policies of multiple federal or state regulatory agencies and offices;
- Unlike drug programs, statistical analysis with SavaDx does not focus on efficacy and safety endpoints. Rather, study endpoints for SavaDx will focus on sensitivity (true positives), specificity (true negatives), positive predictive value (percentage of correct positive diagnoses of known positive cases) and negative predictive value (percentage of correct negative diagnoses of known negative cases).

SavaDx is an investigational diagnostic product candidate that has not yet been reviewed by FDA. Early clinical testing consisted of collecting blood samples on a limited scale to test and validate SavaDx using antibodies or mass spectrometry. Our ability to test such samples and generate accurate results depends on multiple factors, many of which are beyond our control. For example, optimal sample collection depends on risk of sample degradation, storage requirements to preserve samples, cost of sample storage and actual vs. predicted time of assay validation.

We have conducted four early validation tests using SavaDx. In three blinded studies of test samples, SavaDx detected more than a 10-fold separation between Alzheimer's patients and normal healthy control subjects (N=232 test samples). In these three proof-of-concept studies, SavaDx demonstrated nearly 100% accuracy and specificity. The three studies deployed a research grade antibody manufactured by an outside vendor.

A fourth blinded study of SavaDx failed to generate meaningful diagnostic data. We believe the fourth study deployed a faulty research antibody sourced from an outside vendor. Commercially available research antibodies can present certain technical flaws, such as improper validation, significant batch-to-batch variations or inconsistent storage, any of which can jeopardize results of studies and experiments.

In July 2021, we announced positive clinical data with SavaDx when used to measure plasma levels of altered filamin A before and after simufilam treatment in patients with Alzheimer's disease. In a Phase 2b randomized, controlled trial sponsored by the National Institutes of Health (NIH), simufilam significantly reduced a plasma marker of altered filamin A in Alzheimer's patients treated for 28 days. Plasma levels of p-tau181 also dropped significantly in these same patients, as measured by Quanterix Corporation, a third-party vendor.

SavaDx is currently designed as an antibody-based detection system for filamin A (FLNA). Working with third parties, we are evaluating the use of mass spectrometry to detect FLNA, i.e., without the use of antibodies. These evaluations are on-going.

The legal system for intellectual property around diagnostic methods is highly complex and uncertain. In the U.S., patent courts have struggled to define a clear means of patent eligibility for modern age diagnostics. Generally, a simple process involving correlations between blood test results and patient health is not eligible for patent claims because such processes incorporate "laws of nature". However, different outcomes from different courts, including Federal Circuit, district court and Patent Trial and Appeal Board decisions, have continued to create a sometimes vague or conflicting legal framework for determining the eligibility of patent claims for diagnostic methods. As a result, we cannot be certain how SavaDx fits into the current U.S. legal framework for obtaining effective patent claims. Furthermore, claims for diagnostic methods can be complicated to enforce.

We currently have no issued patents in the United States with respect to SavaDx.

Expansion of Our Science to Other Indications

Protein misfolds occur in a wide variety of biological processes and diseases. We may leverage our scientific insights in neurodegeneration and neuroinflammation and advanced tools in molecular biology, biochemistry, and imaging to expand our science to other diseases. New indications and new drug development approaches may complement our initial focus on Alzheimer's disease.

Preclinical programs are always visionary, sometimes innovative and often of high biomedical potential. By definition, such programs are exploratory and risky. Most preclinical programs fail for scientific or other reasons, regardless of the amount of effort or resources that are brought to bear. For these reasons, we do not intend to disclose our preclinical programs until they become material to our pipeline of product candidates.

We Own Worldwide Rights to Our Neurodegeneration Program

We own intellectual property, including patents, patent applications, technology, trade secrets and know-how in the U.S. and other countries. The protection of patents, designs, trademarks and other proprietary rights that we own or license is critical to our success and competitive position. We consider the overall protection of our patents and other intellectual property rights to be of material value and act to protect these rights from infringement.

We seek to protect our technology by, among other methods, filing and prosecuting U.S. and foreign patents and patent applications with respect to our technology and products and their uses. The focus of our patent strategy is to secure and maintain intellectual property rights to technology for our program in neurodegeneration.

Simufilam was discovered and designed in-house and was characterized by our academic collaborators during research activities that were conducted from approximately 2008 to date. SavaDx is being developed in-house with outside collaborators. We own exclusive, worldwide rights to those drug and diagnostic assets and related technologies, without royalty obligations to any third party. Our patent protection with respect to simufilam and use of simufilam for Alzheimer's disease and other neurodegenerative diseases currently runs through 2039 and includes nine issued U.S. patents. In addition, we have patent protection with respect to simufilam for use in treating certain cancers that runs through 2033. Our patent estate further includes patents and patent applications for related compounds and treatments. Corresponding foreign filings have been made for each of the U.S. filings.

Our Development Team

Our product development team is led by seasoned professionals with a proven track record of innovation in drug discovery and development, as well as substantial business expertise.

Our Founder and Chief Executive Officer, Remi Barbier, has over 25 years of biopharmaceutical industry experience and has led teams responsible for pioneering several pharmaceutical innovations, including abuse-deterrent technology for opioid drugs; the clinical development of multiple pain drug candidates; an innovative antibody program in cancer; and other programs in neuroscience and other therapeutics areas. Before founding Cassava Sciences, he held leadership roles and was founder or co-founder of three life science companies, all of which are now either publicly traded or were acquired.

EXHIBIT 30



Cassava Sciences' Simufilam Improves Cognition and Behavior in Alzheimer's Disease in Interim Analysis of Open-label Study

February 2, 2021

- Patients' Cognition Improved 1.6 Points on ADAS-Cog11 -

- Patients' Behavior Improved 1.3 Points on NPI -

- Improvements Maintained at 6 Months -

- Results Support Advancing Simufilam into Phase 3 Clinical Program -

AUSTIN, Texas, Feb. 02, 2021 (GLOBE NEWSWIRE) -- Cassava Sciences, Inc. (Nasdaq: SAVA) today announced results of an interim analysis from an open-label study of simufilam, its lead drug candidate for the treatment of Alzheimer's disease. Patients' cognition and behavior scores both improved following six months of simufilam treatment, with no safety issues.

In a clinical study funded by the National Institutes of Health and conducted by Cassava Sciences, six months of simufilam treatment improved cognition scores by 1.6 points on ADAS-Cog11, a 10% mean improvement from baseline to month 6. In these same patients, simufilam also improved dementia-related behavior, such as anxiety, delusions and agitation, by 1.3 points on the Neuropsychiatric Inventory, a 29% mean improvement from baseline to month 6.

Alzheimer's is a progressive disease. Over time, a patient's cognition will always worsen. *"Experience based on longitudinal studies of ambulatory patients with mild to moderate Alzheimer's disease suggest that scores on ADAS-cog decline by 6 - 12 points per year"*, according to FDA's Prescription Information sheet for ARICEPT® (donepezil), a drug approved for the treatment of dementia of the Alzheimer's type ¹.

"We could not be more pleased with these interim results," said Remi Barbier, President & CEO. "We would have been satisfied to show simufilam stabilizes cognition in patients over 6 months. An improvement in cognition and behavior tells us this drug candidate has potential to provide lasting treatment effects for people living with Alzheimer's disease. It's an exciting development."

The safety profile of simufilam in the interim analysis was consistent with prior human studies. There were no drug-related serious adverse events. Adverse events were mild and transient.

"Today's data once again suggests simufilam could be a transformative, novel therapeutic," added Nadav Friedmann, PhD, MD, Chief Medical Officer. "It appears the drug's unique mechanism of action has potential to provide a treatment benefit following 6 months of dosing."

About the Interim Analysis

Cassava Sciences' on-going, one-year, open-label, multi-center study is evaluating the long-term safety and tolerability of simufilam 100 mg twice daily in 100 patients with mild-to-moderate Alzheimer's disease. This study was initiated March 2020 and is now approximately 80% enrolled. Today's pre-planned interim analysis summarizes clinical data at the midway point of enrollment, i.e., the first 50 patients who have completed at least 6 months of drug treatment.

ADAS-Cog (Alzheimer's Disease Assessment Scale-Cognitive Subscale) is a standard test for assessing changes in cognition in Alzheimer's disease trials. NPI (Neuropsychiatric Inventory) is a widely used tool for measuring changes in dementia-related behavior. The Mini-Mental State Exam (MMSE) is a widely used test of cognitive function among the elderly. The interim analysis shows mean baseline scores of 15.5 on ADAS-Cog11, 4.5 on NPI and 22.1 on MMSE.

Much of the value of the open-label study is to gain data to support simufilam's long-term safety profile in patients. Interim efficacy data from an open-label study has limitations compared to efficacy data from a fully completed, large, randomized controlled clinical trial, or from a fully enrolled open-label study. However, prior clinical research in Alzheimer's disease conducted by other sponsors can serve as a contextual reference for estimates of an expected rate of decline in cognition in placebo patients:

- In 2019, a randomized controlled trial of aducanumab (Biogen) was conducted in >1,000 patients with early Alzheimer's disease.² In this Phase 3 study (EMERGE), patients on placebo showed a mean decline in cognition of approximately 1.4 points on ADAS-Cog13, a 6.3% decline, from baseline to month 6. Mean baseline ADAS-Cog13 score was 22.2. Mean baseline MMSE was 26.4.
- A randomized controlled study of ARICPET® (donepezil, Eisai) was conducted in >400 patients with mild-to-moderate Alzheimer's disease.³ In this Phase 3 study, patients on placebo showed a mean decline in cognition of approximately 1.9 points on ADAS-Cog, a 7.3% decline, from baseline to week 24. Mean baseline ADAS-Cog score was 26. MMSE range was 10-26.

Next Steps

Cassava Sciences believes today's data and prior clinical results support advancing simufilam into a Phase 3 clinical program in Alzheimer's disease. Initiation of a Phase 3 trial remains on schedule for 2nd half 2021.

Cassava Sciences and the U.S. Food and Drug Administration (FDA) recently concluded a successful end-of-phase 2 (EOP2) meeting for the simufilam drug development program. Details of the EOP2 meeting will be announced Q1 2021 after official FDA meeting minutes are finalized.

Based on today's results and inbound demand from Alzheimer's patients and their caregivers, the enrollment target for the open-label study will be increased by up to 50 additional patients, to a total target of approximately 150 patients. The Company is also in discussions with its scientific and clinical advisors about other potential enhancements to the open-label program.

About Alzheimer's Disease

Alzheimer's disease is a progressive brain disorder that destroys memory and thinking skills. Currently, there are no drug therapies to halt Alzheimer's disease, much less reverse its course. In the U.S. alone, approximately 5.8 million people are currently living with Alzheimer's disease, and approximately 487,000 people age 65 or older developed Alzheimer's in 2019. ⁴ The number of people living with Alzheimer's disease is expected to grow dramatically in the years ahead, resulting in a growing social and economic burden. ⁵

About Simufilam

Simufilam is a proprietary, small molecule (oral) drug that restores the normal shape and function of altered filamin A (FLNA), a scaffolding protein, in the brain. Altered FLNA in the brain disrupts the normal function of neurons, leading to Alzheimer's pathology, neurodegeneration and neuroinflammation. The underlying science for simufilam is published in peer-reviewed journals, including *Journal of Neuroscience*, *Neurobiology of Aging*, *Journal of Biological Chemistry*, *Neuroimmunology and Neuroinflammation* and *Journal of Prevention of Alzheimer's Disease*.

Cassava Sciences is also developing an investigational diagnostic, called SavaDx, to detect Alzheimer's disease with a simple blood test.

Simufilam and SavaDx were both developed in-house. Both product candidates are substantially funded by peer-review research grant awards from the National Institutes of Health (NIH). Cassava Sciences owns worldwide development and commercial rights to its research programs in Alzheimer's disease, and related technologies, without royalty obligations to any third party.

About Cassava Sciences, Inc.

Cassava Sciences' mission is to discover and develop innovations for chronic, neurodegenerative conditions. Over the past 10 years, Cassava Sciences has combined state-of-the-art technology with new insights in neurobiology to develop novel solutions for Alzheimer's disease. For more information, please visit: <https://www.CassavaSciences.com>

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The content of this press release is solely the responsibility of Cassava Sciences and does not necessarily represent the official views of the NIH/NIA.

Cassava Sciences Safe Harbor

This news release contains forward-looking statements, including statements made pursuant to the safe harbor provisions of the Private Securities Litigation Reform Act of 1995, relating to: our strategy and plans; the treatment of Alzheimer's disease; the status of current and future clinical studies with simufilam, including the interpretation of an interim analysis of open-label study results; inherent limitations of the ADAS-Cog and NPI testing batteries; planned enrollment and other changes to the open-label program; our intention to initiate a Phase 3 clinical program with simufilam in 2nd half 2021; results of our EOP2 meeting with FDA and the timing of further announcements; verbal commentaries made by our employees; and potential benefits, if any, of the our product candidates. These statements may be identified by words such as "may," "anticipate," "believe," "could," "expect," "forecast," "intend," "plan," "possible," "potential," and other words and terms of similar meaning. Drug development and commercialization involve a high degree of risk, and only a small number of research and development programs result in commercialization of a product. Our clinical results from earlier-stage clinical trials may not be indicative of full results or results from later-stage or larger scale clinical trials and do not ensure regulatory approval. You should not place undue reliance on these statements or any scientific data we present or publish.

Such statements are based largely on our current expectations and projections about future events. Such statements speak only as of the date of this news release and are subject to a number of risks, uncertainties and assumptions, including, but not limited to, those risks relating to the ability to conduct or complete clinical studies on expected timelines, to demonstrate the specificity, safety, efficacy or potential health benefits of our product candidates, the severity and duration of health care precautions given the COVID-19 pandemic, any unanticipated impacts of the pandemic on our business operations, and including those described in the section entitled "Risk Factors" in our Annual Report on Form 10-K for the year ended December 31, 2019 and future reports to be filed with the SEC. The foregoing sets forth many, but not all, of the factors that could cause actual results to differ from expectations in any forward-looking statement. In light of these risks, uncertainties and assumptions, the forward-looking statements and events discussed in this news release are inherently uncertain and may not occur, and actual results could differ materially and adversely from those anticipated or implied in the forward-looking statements. Accordingly, you should not rely upon forward-looking statements as predictions of future events. Except as required by law, we disclaim any intention or responsibility for updating or revising any forward-looking statements contained in this news release. For further information regarding these and other risks related to our business, investors should consult our filings with the SEC, which are available on the SEC's website at www.sec.gov.

This news release may also contain statistical data and drug information based on independent industry publications or other publicly available information. We have not independently verified the accuracy or completeness of the data contained in these publicly available sources of data and information. Accordingly, we make no representations as to the accuracy or completeness of such data or information. You are cautioned not to give undue weight to such data.

¹ Source: https://www.accessdata.fda.gov/drugsatfda_docs/label/2018/020690s042.021720s014.022568s011lbl.pdf (2018)

² Source: Biogen, EMERGE Phase III study, slide 24, <https://investors.biogen.com/static-files/8e58afa4-ba37-4250-9a78-2ecfb63b1dcb> (2020)

³ Source: https://www.accessdata.fda.gov/drugsatfda_docs/label/2018/020690s042.021720s014.022568s011lbl.pdf (2018)

^{4, 5} Source: Alzheimer's Association. Disease Facts and Figures. <https://www.alz.org/media/documents/alzheimers-facts-and-figures-2019-r.pdf>



Source: Cassava Sciences, Inc.